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TREATISE

ON THE

PRACTICE OF MEDICINE,

BY

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SIXTH EDITION.

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quently involved with the substance of the lungs; but, when the inflammation is confined to that portion of the investing membrane which is in contact with the diseased pulmonary tissue, it is not generally deemed worth while to give the affection a distinct title. When large portions of the pleura are affected, the disease receives the name of *pleuro-pneumonia*. The complaint is frequently *primary;* but it is also frequently a mere accompaniment of other diseases, in which case it is called *secondary*. When associated with a low or typhous condition of the system, it is named *typhoid pneumonia;* and when with bilious disorder, whether dependent on simple derangement of the liver, or upon a concurrent bilious fever, *bilious pneumonia*. Finally, the disease may be of short, or of protracted duration, or in other words may be *acute* or *chronic*. In the following remarks, the ordinary arrangement pursued in this work will be deviated from by treating first of the anatomical characters of the complaint; because, without a knowledge of these, we can have no just idea of the value of many of the symptoms.

Anatomical Characters.

1. *Common or Lobar Pneumonia.*—There are three well-marked stages in acute pneumonia; viz., 1. that of congestion, 2. that of fully-developed inflammation, and 3. that of suppuration.

In the *first stage*, or that of *congestion*, the affected portion of the lung is of a deep-red colour, crepitates under pressure, though less than in health, retains the impression of the finger, and, when cut, exudes copiously a bloody, turbid, and somewhat frothy serum. It is more compact and heavy, but less tenacious than in health, and, notwithstanding its increased density, still floats in water. The cells are not yet obliterated, and, though somewhat obstructed by extravasation, still contain air. The condition altogether very much resembles the mechanical congestion occasioned by the gravitation of the blood after death, or at the very close of life; but the colour is usually of a brighter red, and the softening greater. The position of the congestion may also sometimes aid in the formation of a correct judgment; as, if mechanical, it must occupy the most dependent part of the lung, which is not necessarily the case when it is vital. If the disease is arrested in this stage, the lung reassumes the healthy appearance; if not, it passes into the condition described in the following paragraph. Dr. Stokes maintains that the congestive stage, with the characters above mentioned, is preceded by another, marked by intense arterial injection with dryness; in other words, a condition of irritation, which, as taught in this work, always precedes inflammation.

The *second stage*, named by Laennec that of *red hepatization*, by Andral that of *red softening*, is characterized by a deep-red, reddish-brown, or grayish-red colour, the absence of crepitation under pressure, a density so much increased that the diseased lung will sink in water, and a diminution of cohesion still greater than in the first stage. The grayish colour sometimes observed is owing to an intermixture of particles of the black pulmonary matter, and to the lighter hue of the interlobular tissue, which is occasionally less congested than the other parts. The softening is so great that the lung may be readily torn, and the finger may be passed through the parenchyma with little resistance. It is greater in proportion as the inflammation has been more acute and recent. When cut into, the lung bears a striking resemblance to liver; and on this account is said to be *hepatized*. When pressed between the fingers, it exudes a reddish fluid, which is thicker, less frothy, and in less amount than that observed under similar circumstances in the congestive stage. The cut or torn surface of the lung generally exhibits numberless minute granules, which are probably the air-cells filled and distended with concrete fibrinous exudation, though Dr. Williams ascribes them to interstitial deposit

PRACTICE OF MEDICINE.

PART II., OR SPECIAL PATHOLOGY,

CONTINUED.

CLASS III., OR LOCAL DISEASES,

CONTINUED.

SECTION III., OR DISEASES OF THE RESPIRATORY ORGANS,

CONTINUED.

SUBSECTION III.

ORGANIC DISEASES OF THE PULMONARY TISSUE AND PLEURA.

Article I.

INFLAMMATION OF THE LUNGS, OR PNEUMONIA.

Syn.—*Peripneumonia.*—*Pneumonitis.*—*Pulmonitis.*

The name of pneumonia is now universally applied to inflammation of the spongy tissue or parenchyma of the lungs. There are numerous varieties of this disease, which it will be most convenient to notice in the present place, because reference will be frequently made to them throughout the subsequent remarks. These varieties are founded upon the different portions of the lungs, or the different constituents of any one portion, which may be inflamed, upon the relation of the disease to other diseases with which it may be associated, and upon the character of the accompanying fever or general state of system. The inflammation may occupy a considerable extent of the lungs continuously, embracing a whole lobe more or less, or even one whole lung. This is the common form of the disease, and the one usually meant, when the simple term pneumonia is employed. For the sake of distinction it is sometimes called *lobar pneumonia.* Sometimes small isolated portions of the lungs are inflamed, as, for example, distinct lobules or parts of lobules, with sound lung intervening. In this case, the complaint is denominated *lobular pneumonia.* Though the inflammation is usually confined to one lung, it occasionally involves both, and, in the latter case, is distinguished by the name of *double pneumonia.* In some rare instances, it appears to affect chiefly or exclusively the air-cells, and may then be called *vesicular pneumonia,* though Rilliet and Barthez name it *vesicular bronchitis.* Again, the inflammation is sometimes seated more especially in the areolar tissue intervening between the different air-vesicles, or between the lobules, in which case it has been proposed to name it *intervesicular,* or *interlobular pneumonia.* Most generally, however, it occupies the whole of the constituents which form the pulmonary parenchyma, including the air-cells, the smaller bronchial tubes, the intervening areolar tissue, and the vascular ramifications. The pleura is very fre-

The three different conditions just described are sometimes, but not always, distinct. They are in fact often more or less intermingled. Thus, in the midst of a congested portion of the lungs, some spots of red hepatization may appear, and, in the midst of the latter, some spots of gray hepatization, which give a mottled appearance to a section of the diseased lung. Sometimes the three conditions exist at the same time, the gray hepatization being in the centre, the red around it, and the congestion on the borders of the latter, though the boundary between them is not accurately defined. In relation to the pathology of these different conditions, it may be sufficient to state that, in the first, the vessels are merely engorged with blood, and the air-cells partly filled with a sero-mucous, somewhat bloody effusion; in the second, a plastic extravasation has taken place, and the cells, as well as the intercellular tissue, are filled with a more or less concrete and bloody lymph; in the third, the place of the plastic secretion has been supplied by a purulent fluid. The pleura is very frequently, but not always, inflamed over the hepatized portion of the lung. Coagulable lymph is often thrown out, forming a false membrane upon its surface; and sometimes the two opposite surfaces adhere; while a little turbid serum is found in the pleural cavity. In some instances, the inflammation of the pleura is much more extensive; and then the disease comes under the designation of pleuro-pneumonia. (See *Pleuro-pneumonia.*) The bronchia, both large and small, are almost always inflamed, containing mucus, and exhibiting a reddened surface; and if one lobe is inflamed, the bronchial tubes going to that lobe are also affected. The bronchial glands are often enlarged, reddened, and softened. The right cavity of the heart frequently contains red and soft, or yellowish and firm coagula.

In a great majority of cases, the morbid phenomena are confined to one lung; and the right lung is much more frequently affected than the left. From a comparison of 1430 cases, collected by M. Grisolle from various authors, it appears that the cases of double pneumonia were about 18 per cent. of the whole number, those of the left side about 30 per cent., and those of the right side about 52 per cent. In secondary pneumonia, the opposite sides appear to be about equally affected. In relation to the part of each lung attacked, Laennec stated that the lower portion was most frequently the seat of the inflammation, and that when this occupied the whole lung, it almost always began in that portion. Some have considered the lower and middle parts as almost the exclusive seats of the incipient inflammation. It is probably true that these are most frequently affected; but observation has shown that the disease not unfrequently also begins in the upper lobe; and in certain seasons this appears to be oftener the case than in others, without any known cause for the difference. Of 264 cases investigated by M. Grisolle, the inflammation began in the lower lobes in 183, at the summit in 101, and at the middle in 30.

2. *Lobular Pneumonia.*—In this variety, which is most common in children under six years of age, and is comparatively rare in adults, the inflammation occupies distinct spots, surrounded by healthy tissue. These little islands of inflammation may be distinctly defined, occupying one or several lobules, and abruptly bounded by the interlobular areolar tissue; or they may gradually run into the surrounding parenchyma, so that their limits cannot be precisely fixed; or, finally, they may run together, and thus form one continuous mass of inflammation, as in the common form of the disease. Of these three forms, the first is less frequent than the other two; and sometimes all are found in the same patient. (*Rilliet and Barthez.*) The patches of inflammation are exceedingly diversified in size, form, number, and position. Those with definite boundary may vary in magnitude from the size of a millet-seed to that of an egg; may be spherical, elongated, or quite irregular; may number from one to thirty or more in the same lung; and may occupy both lungs, or, what is

comparatively rare, may be confined to one, and, in either case, are most frequently met with in the posterior part of the lung. In consequence of the red colour of the inflamed spots, they often contrast strikingly with the healthy structure, and give the lung, both on its external and cut surface, a marbled appearance. They are more prominent than the neighbouring tissue, from not collapsing when exposed to atmospheric pressure, and have a firmer feel under the finger. In fatal cases, they are sometimes found almost filling up both lungs, and leaving but a small portion permeable by the air. (*Gerhard.*) They present the same stages of congestion, red hepatization, and suppuration, as occur in ordinary lobar pneumonia. In the third or suppurative stage, when the pus is disseminated equably through the diseased structure, they do not differ materially in colour from the healthy parenchyma; but may be distinguished by their greater prominence and density, and by exuding a purulent liquid when pressed. Abscesses are not unfrequent in this variety of pneumonia, probably in consequence of the small extent of the inflamed patches. These are sometimes single and isolated, sometimes run together, and generally have a tendency to approach the surface. They may communicate with the bronchia, or a neighbouring cavity, or may have no outlet. In the latter case, there is reason to believe that the pus is sometimes absorbed. They may occupy both lungs, but are more frequently found in one only. (*Rilliet and Barthez.*)

It has been demonstrated by MM. Bailly and Legendre that, in many instances, what has been taken for lobular pneumonia in infants is not true hepatization, but a consolidation of the lobule such as exists in the fetal state. This consolidation they believe may be wholly independent of inflammation, and the consequence merely of the contractility of the pulmonary tissue, or may be the result of compression of the vesicles by vascular congestion exterior to them. Dr. Gairdner has rendered it probable that the condition is generally, if not always, the result of bronchitis, in which the viscid mucus so clogs certain bronchial tubes as to allow the exit, but to prevent the access of air, in consequence of which the air-cells, supplied by the tubes thus closed, collapse; and he has shown that the same result not unfrequently takes place, from the same cause, in adults. That the consolidation is produced by collapse, and not by inflammation of the pulmonary tissue, is proved by the fact that the solidified parts, unlike hepatized lung, may often be expanded by insufflation. As the affection, however, is connected with an inflammatory condition of the tubes, it is easily conceivable that this may have extended into the solidified portion before collapse, which may thus sometimes put on the appearance of parenchymatous inflammation. But we may attach full credence to the observations of MM. Bailly and Legendre, and of Dr. Gairdner, without surrendering our previous convictions in relation to the existence of the lobular pneumonia of children. It is sufficient to admit that many cases have been mistaken for that affection which were of a different nature. It is scarcely possible that the most accurate observers, who have investigated what they deemed lobular pneumonia, could have been altogether mistaken; and the progress of the insolated and defined patches of inflammation has been too often traced through its different stages, to admit of a denial of their occasional and even frequent existence. The pneumonia of children, however, is much more apt than that of adults to result from a propagation of inflammation from the bronchial tubes to the vesicular structure; and it is probable that the lobular pneumonia generally originates in this way.

3. *Vesicular Pneumonia.*—Under the name of *vesicular bronchitis*, Rilliet and Barthez describe a variety of pneumonia in which the inflammation appears to be confined to the air-cells, and perhaps small portions of the communicating bronchial tubes, without extending to the intervening areolar tissue. When the lung is cut, it exhibits a vast number of gray or yellowish granules, of the

size of millet-seed, and bearing no inconsiderable resemblance to miliary tubercles, being about equal in size, and like them disseminated; but distinguishable by their want of hardness, and by exuding a drop of pus and collapsing when cut. (*Maladies des Enfants*, i. 21.)

4. *Typhoid Pneumonia.*—When pneumonia is associated with a low or asthenic state of system, the disease appears sometimes scarcely to pass the stage of congestion; or, if it does so, the blood remains liquid, and yields none of the plastic secretion which gives solidity to ordinary hepatization; and the inflammation, if it continue, is apt to run into gangrene or imperfect suppuration. Of this nature appears to be the condition of the lung called *splenisation*, in which the diseased portion, though gorged with blood, and so dense as to sink in water, is quite soft like the spleen. The pneumonia in such cases is usually secondary, or associated with other diseases of a low and feeble character. Under this head may also be arranged the *hypostatic pneumonia* of some writers, which results from the pulmonic congestion produced by lying long and constantly on the back, in debilitated states of the system.

5. *Chronic Pneumonia.*—Under this head might be placed the abscesses which occasionally follow acute pneumonia, and continue sometimes for many months before coming to their termination in health or death. But there is another form of chronic pneumonia, in which the hepatization consequent upon acute inflammation, instead of undergoing resolution or passing into the suppurative stage, assumes a permanent character. In such cases, the lung is found compact and heavy, pitting little or none upon pressure, not crepitant, tearing with difficulty, sometimes almost cartilaginous, and, when cut, exuding only a little serous fluid. The cut surface is sometimes smooth and uniform, sometimes finely granular, and occasionally striated or veined. The colour is dull-red, reddish or yellowish-brown, or grayish. When distinct lobules are affected, the lung has an irregular surface, and a knotty feel. The volume of the lung is somewhat diminished, and the chest consequently contracted. The pleura is often adherent. Sometimes abscesses exist within the hardened structure, and in one instance gangrene was observed by Andral. Rilliet and Barthez describe a condition of the lungs in the pneumonia of infants, which they call *carnification*, and consider as the result of chronic inflammation. The diseased portion of the lung is depressed on the surface, soft, and flaccid, not crepitant, and of a violaceous or pale-red colour, marbled with white lines which define the lobules. Its cut surface is red, glossy, and penetrable with difficulty, and when pressed exudes a bloody serum. Its appearance is like that of a muscle with close and indistinct fibres. (*Maladies des Enfants*, i. 73.) This, however, is undoubtedly the state of collapse described by MM. Bailly and Legendre, and which Dr. Gairdner has shown to exist occasionally in adults as a consequence of bronchitis.

6. *Secondary Pneumonia.*—It has been already stated that pneumonia, besides existing independently, as in the preceding forms, very often also occurs in the course of other diseases, as typhus and enteric fevers, bilious remittent and intermittents, rheumatism, and catarrhal fever. In such cases, the disease is often much modified in its symptoms, and even in its anatomical characters. These peculiarities, when not already pointed out in the articles on the different diseases referred to, will be particularly noticed hereafter.

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sionally the characteristic symptoms of the disease are preceded for some days by general uneasiness, lassitude, loss of appetite, and more or less fever. Not unfrequently the disease commences with catarrhal symptoms, which continue for several days before signs of pneumonia become manifest. In secondary pneumonia, the disease often begins obscurely, without pain, cough, or fever, unless this has previously existed, and is recognizable only by the hurried respiration, depression of strength, and the physical signs. Pneumonia is apt to assume this obscure form, when complicated with cerebral disease.

When fully developed, the complaint is characterized, in most cases, by fever, quickened breathing, pain in the chest, cough, and a scanty viscid expectoration often intimately mixed with blood. On each of these symptoms it is necessary to dilate; as they are liable to great diversity.

The *pain* may either precede, accompany, or follow the commencement of the fever. It is often in the beginning very acute and severe, is much increased by a full breath, coughing, or pressure between the ribs, and is situated either in the side or back part of the chest, or in the mammary region. When both lungs are inflamed, it is sometimes felt on both sides, and sometimes referred to the vicinity of the sternum. The sharp pain is probably owing to the participation of the pleura, covering the affected portion of the lung, in the inflammation. It is in general quickly subdued by depletion, or by the other remedies employed, and only an obtuse pain remains. But, in many instances, there is no acute pain either in the beginning, or in the course of the disease. Instead of it, the patient complains of a dull, aching sensation, or of soreness, oppression, stricture, weight, or heat, sometimes referred to the side, sometimes to the anterior part of the chest, and often to the epigastrium. Occasionally the pain is rendered sensible only by a deep inspiration, or is evolved by percussion when otherwise latent. It sometimes happens that no uneasiness whatever is felt, calculated to excite suspicion.

The *breathing* is always quickened. The number of respirations may be increased from between sixteen and twenty in a minute, the average standard of health, to thirty, forty, fifty, or even sixty. At the same time there is almost always a feeling of oppression, which is increased by speaking, or other vocal effort. The dyspnœa is sometimes very urgent, necessitating an erect position, and rendering it difficult for the patient to speak. It is increased usually with the extent of inflammation, and of the consequent consolidation of the lung. But it differs very much in different individuals, even with the same amount of local disease. Inflammation in the upper lobe is said to be attended with more of it than in the lower. (*Watson.*) Violent dyspnœa, with short and quick respiration, and a purple or livid colour of the face, is indicative of very great danger.

Cough, in a greater or less degree, is almost always present in the course of the disease. I have known it, however, entirely wanting for several days after the commencement of a very severe attack, involving the greater part of the left lung. It is in some instances violent and painful, in others moderate and with little or no pain. At first it is usually dry, or attended with only a little mucous expectoration, if the disease is uncomplicated. But very soon, often in a day or two, a viscid semi-transparent matter is thrown up, which either is in the beginning or very soon becomes stained more or less with blood, so as to have a reddish or rusty colour, sometimes inclining to yellow or green, according to the quantity of blood present. As the disease advances, these properties of the sputa become more striking. The tenacity is so great that the matter adheres to the vessel containing it, when this is turned bottom upward. Sometimes, when more copious, it runs together, so as to form a kind of tremulous jelly. This viscid and rusty-coloured expectoration is probably the most characteristic general sign of pneumonia, and sometimes indicates its existence even when the physical signs fail. In some instances, nearly pure blood is expectorated; but this is comparatively rare, and very generally the blood is intimately incorporated with the viscid semi-transparent matter. The sputum is thus distinguished from that of bronchitis, which is often streaked with blood. The expectorated matter comes from the minute tubes, and is the result of a slow exudation from the inflamed vessels, during which the intimate admixture of its constituents takes place. It contains a large proportion of coagulated fibrin. Dr. R. Remak has observed that the expectoration of pneumonia, if carefully examined in a dark-coloured flat vessel filled with water, or upon a dark glass plate, will always be found to contain ramifying tubular coagula, corresponding with the minute bronchia in which they have been formed. (*Brit. and For. Med. Rev.*, April, 1847, p. 505.) Dr. J. Da Costa, however, states that he has frequently sought for them in vain both in the sputa and the air-cells. (*Am. Journ. of Med. Sci.*, Oct. 1855, p. 302.) When the catarrhal symptoms are mingled with those of pneumonia, there is often a more copious expectoration of transparent and sometimes frothy mucus; and, in such cases, portions of the true pneumonic expectoration may be seen mixed with the catarrhal in the cup, one being thrown up at one time and the other at another. As the complaint advances, the secretion increases, but is seldom very copious in pure pneumonia. In the latter stages, the expectoration sometimes again becomes more scanty. Occasionally it is purulent, in consequence either of a changed secretion of the bronchial tubes, or of the discharge of the pus of the vesicles. In some rare cases, it becomes all at once purulent and copious, from having been previously scanty and fibrinous. The quantity of matter is sometimes so large as to overwhelm the debilitated lungs, and thus to prove suddenly fatal. This result occurs more especially in young children. It indicates the opening of an abscess into the bronchial tubes. This was formerly thought to be common; but has been proved by dissection to be a rare event in pneumonia. Sometimes, instead of the characteristic viscid sputa, we see a copious expectoration of a uniform liquid, like mucilage, which is more or less tinged with blood. Towards the close of bad cases, this assumes occasionally a dark appearance, like that of liquorice dissolved in water, to which it is compared by Andral. This is usually a fatal symptom. A fetid odour of the expectoration indicates gangrene, but is very rare.*

In relation to the *decubitus*, the patient most frequently lies on the back, with his head and shoulders somewhat raised. Sometimes, however, he prefers lying on the side, and, in the case of inflamed pleura, on the one opposite to that affected.

Fever is an almost uniform accompaniment of severe cases; and, in some instances, constitutes, with increased frequency of respiration, the only obvious affection. It varies extremely in degree, being sometimes so mild as almost to escape notice, and sometimes in the highest degree intense. It is very often attended with flushed cheeks and pain in the head, especially about the brows or forehead, from which the patient may even suffer more than from the pain in the chest. Occasionally, the headache is the only symptom of which the patient complains for the first few days. Delirium now and then occurs, and is usually an unfavourable sign. The fever often has a remittent character; the exacerbations occurring daily, for the most part towards evening, and accompanied with increase of pain, cough, dyspnœa, and bloody expectoration. The pulse is usually full, strong, and only moderately accelerated; but it is sometimes very frequent even from the beginning, and in the latter case is apt to be smaller and less vigorous. It sometimes reaches one hundred and forty in the adult. Blood drawn from the arm is almost always buffed, and not unfrequently strongly cupped; or, if it has not this character at the commencement, very soon acquires it. The skin is usually hot and dry, though occasionally moist. The urine is generally scanty and high-coloured. Thirst and loss of appetite are almost universal. The tongue is generally moist, and coated with a white or yellowish-white fur; but is sometimes clammy, or dry and red. Vomiting and diarrhœa are occasional symptoms, the latter more especially in the advanced stage; but both are accidental. Frequently the patient is prostrated from the commencement; but, in mild cases, he sometimes keeps upon his feet for several days before taking to his bed.

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* Dr. Boling, of Montgomery, Alabama, has noticed, in many cases of pneumonia, an appearance in the mouth which he considers characteristic. "It consists of a deposition on the teeth, just along the margin of the gums, of a matter of different shades of colour, from a light orange to a dull vermilion, forming a line about the sixteenth of an inch wide, of a deeper tint at the gums, and paler as it recedes." He suggests that the miasmatic poisoning of the system, in the pneumonia of the South, may lead to its production. (*Am. Journ. of Med. Sci.*, N. S., xxiv. p. 278.)

An observation originally made by Dr. Redtenbacher, in relation to the absence of chloride of sodium from the urine in pneumonia, has been confirmed by Dr. L. S. Beale, of London. The salt disappears from the urine when hepatization begins. Dr. Beale ascertained, as the result of numerous trials, that the chloride returns soon after resolution has taken place, that during its absence there is more than the normal proportion of the salt in the serum of the blood, and that the sputa contain a larger proportion than healthy mucus; and infers that its absence from the urine depends on its determination to the inflamed lung. (*Lond. Medico.-chirurg. Trans.*, xxxv. 374.)

The *physical signs* are of the highest importance in the diagnosis of pneumonia. The disease is often very obscure; and, before the discovery of the processes of percussion and auscultation, many cases ran their whole course quite unsuspected. Cough and pain in the chest are sometimes wanting; and fever with headache and hurried respiration, which are common to this with numerous other diseases, are the only observable phenomena. Even the symptom of viscid and rusty sputa often fails us. Either the patient swallows the expectorated matter, as generally happens in infants; or no expectoration whatever may take place; or the discharge, from a predominance of catarrhal or hemorrhagic affection, may want the characteristic properties. In many of these cases, percussion and auscultation combined afford sure evidence of the nature of the disease. Yet even these do not always succeed; as, for example, when the inflammation occupies an interior portion of the lung, and is everywhere surrounded by healthy structure.

In the first stage, or that of congestion, percussion affords little evidence of the condition of the lung. There is usually a slight diminution of the healthy resonance but not so decided as to serve for a ground of diagnosis.* A sense of diminished elasticity is imparted to the finger, when this is used as the pleximeter. But auscultation is much more decisive. By this it may be discovered that the healthy vesicular murmur has given place to the crepitant rale, though the former may be sometimes heard mingling feebly with the latter, before it is quite lost. The crepitation is more distinctly audible the nearer the disease happens to be to the surface of the lung. It is generally stated to be heard only during inspiration. Though it may at first be confined to the beginning of the inspiration, it soon extends throughout that movement. It is certainly extremely rare in expiration; and the analogous sound of capillary bronchitis and resolving hepatization, which belongs to the subcrepitant rale, has probably been mistaken for the true primary crepitant rale by those who suppose they have observed it in expiration. It should be recollected, as mentioned in the preliminary observations, that a full inspiration will often develope the crepitus, when not perceptible in ordinary breathing. This is the characteristic sound of pneumonia. Whenever it is heard, the existence of pulmonary inflammation is indicated; and the progress of this affection can be traced, with considerable accuracy, by marking the progress of its attendant sound. In some cases, however, of ordinary genuine pneumonia, it cannot be discovered, even though the disease may be observed from the commencement; probably, as suggested by Dr. Walshe, in consequence of the rapidity with which the vesicles are filled with the exudation. About the inflamed part, when crepitation has not yet become manifest, a weakness of the respiratory murmur sometimes indicates the commencement of congestion. In other parts of the chest, the respiration is often puerile; and Dr. Stokes observed that this greater loudness of the natural murmur precedes the occurrence of the crepitant rale, an effect probably ascribable to the narrowing of the minute tubes, while the vesicles yet remain empty, so that the air has a more than usually rapid movement. There is often also increased resonance on percussion over the unaffected part of the lung. According to Dr. Boling, a fine mucous or crepitant rale, heard in the larynx, even at some distance from the patient, persisting notwithstanding efforts at expectoration, and without evidence of disease or of the presence of mucus itself in the larynx, is a sign of pneumonia affecting the apex of the lung. One of the characters by which this sound may be distinguished from that produced by mucus in the larynx, is the perfect indifference of the patient, who makes no effort to clear his throat, unless prompted to do so. (*Am. Journ. of Med. Sci.*, N. S., xiv. 125.)

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* According to Skoda, alteration of the sound does not take place from mere congestion, but is first perceived when exudation has begun, and is then somewhat tympanitic, so long as the portion of lung affected still contains air; and this tympanitic character of the percussion sound sometimes continues, even after it has become quite dull. No change will be perceived in the percussion sound, or in the sense of resistance, unless the infiltrated tissue is in contact with the thoracic wall, and at least an inch thick. The probability is that the tympanitic resonance, which sometimes replaces the normal percussion sound in pneumonia, is owing, in some instances, to the conveyance, through the consolidated lung, of sonorous vibrations from the stomach or colon, in others, to a similar conveyance from the larger bronchial tubes, which, remaining open while the vesicular tissue is filled up with exudation, cannot but impart something of the tubal or tympanitic character to the percussion sound, though it may be feeble. (*Note to the fourth and fifth editions*)

As the disease advances into the second stage, the crepitation ceases; and, the respiratory murmur having been previously abolished, either no sound is heard, or only that of bronchial respiration, which is one of the characteristic signs of hepatization. Dr. James Jackson, of Boston, observed that the expiratory murmur became prolonged and somewhat blowing, before the true bronchial respiration was established; and Grisolle states that, of twenty-four cases which he carefully examined, twenty-one presented the expiratory sound exclusively, before the respiratory murmur became in any degree bronchial. It is only in a comparatively few instances, that the ear is sensible of no other impression than the one produced by the rise and fall of the walls of the chest. This happens sometimes when the inflammation occupies the lowest portion of the lung, where there are no large tubes, or the whole lung, so that respiration ceases on the side affected. Usually the bronchial respiration is heard distinctly. It is loudest when the parts surrounding the larger tubes are inflamed, as near the root of the lung. The sound is owing to the consolidation of the inflamed structure, enabling it to convey to the ear the tubal vibrations, which, in the ordinary condition of the parenchyma, are arrested in its spongy texture. In some instances, during the passage of the congestion into hepatization, before the latter condition is fully established, the crepitant rale and bronchial respiration are mingled together, and give rise to a sound which has been compared to that produced by the tearing of taffeta. Not uncommonly, while the bronchial sound is heard in one part, generally near the centre of inflammation, crepitation is audible in another, which is usually on the boundaries.

Besides the bronchial respiration, there is also a stronger vocal resonance in the stage of hepatization; the vibration produced in speaking being conveyed more readily through the condensed structure. Bronchophony is, therefore, another characteristic of the second stage. Should the patient be unable to speak, it is asserted that the resonance occasioned by the operator's own voice is conveyed more distinctly to the ear applied to the chest, than in a healthy state of the lungs. Still another important character of this stage is the greater vibration of the walls of the chest when the patient speaks or coughs, rendered sensible by placing the hand upon the chest over the part affected. Should the hepatization, however, be very extensive, I have noticed that this impression is scarcely felt in the more distant parts. But quite as important as either of the above signs is that yielded by percussion in this stage. Instead of the slight diminution of clearness observed in the state of congestion, we have now decided dulness, and sometimes even perfect flatness in the parts most consolidated. The dividing line between clearness and dulness is often well marked, and may be considered as representing the boundary of the consolidated lung; and, as the consolidation is frequently confined to a single lobe, it is obvious that an obliquity in this boundary line, corresponding with the division between the lobes, may serve as a means of diagnosis between the solidification of pneumonia, and the compression from fluid effused into the pleural cavity, as in pleurisy, in which the line of dulness is usually horizontal in the erect position. Dr. Austin Flint was, I believe, the first to call attention to this means of diagnosis.

In some instances, the bronchial respiration and bronchophony are wanting, perhaps in consequence of the filling up or obstruction, at some particular point, of the bronchial tubes entering the hepatized portion of the lung, or the obliteration of the bronchia and air-cells by compression, as in pleuritic effusion, so that the condition on which those sounds depend does not exist. Occasionally the sounds referred to may be heard at one time and not at another, in the same condition of the hepatization. This may be owing to an alternate obstruction and opening of the tube, through the alternate presence and removal of concrete mucus, or from other cause. Dr. Walshe states that he has traced it, in one case, to a pressure on the main tube, acting at different times with different degrees of force.[*]

Should the disease be arrested in the stage of congestion, the crepitant rale gradually ceases, and the respiratory murmur of health is restored. After the establishment of hepatization, should resolution of the disease take place, the bronchial respiration and bronchophony vanish by degrees, and the crepitation returns, in general, however, somewhat modified, and assuming the character of the subcrepitant rale, in consequence of the more fluid nature of the secretion. This sound in its turn gives way to the respiratory murmur, the return of which, together with the healthy resonance upon percussion, is evidence of a restoration of the lung to its healthy state. In some instances, there is a direct passage from the bronchial respiration to the healthy murmur, without the intervention of crepitation.

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[*] According to Dr. Woillez, it not unfrequently happens that bronchial respiration and bronchophony cannot be perceived in cases of hepatization, though abnormal respiratory sounds, such as the sibilant and sonorous rales, and prolonged expiratory sound are heard; so that none of the explanations hitherto given of the absence of the characteristic sounds of pneumonic consolidation are satisfactory, as they all imply exclusion of the air. Dr. Woillez offers an explanation based on his views of the existence of a normal state of dilatation (*béance*) in the pulmonary air-space, in other words, in the air-cells and passages. In the cases referred to, the mass of pulmonary tissue is increased, as shown by the non-collapse or over-expansion of the lungs, on being removed, after death, from the restraint of the chest-walls. By the increase in volume of the solid tissue the air-space is, of course, diminished; and, in these particular cases, to such an extent, as, while the entrance of air is permitted so far as to cause abnormal respiratory murmurs, yet to interfere with the transmission of the vibrations necessary to the production of the bronchial sounds. The abnormal respiration, such as deficient murmur, sonorous rales, prolonged expiratory murmur, &c., arise from the narrowing of the tubes through which the air passes; while their production proves that the lung is to a certain extent permeable, and consequently nullifies, so far as these cases go, the theory which ascribes the absence of the ordinary auscultatory signs of consolidation, to the non-entrance of the air into the diseased tissue. On the theory of M. Woillez, the air-space, while sufficient to permit the abnormal sounds above referred to, is not sufficient to give rise to the bronchial sounds, which require a certain amount of open space for their production. (*Arch. Gén.*, Oct. 1865, p. 468.) —*Note to the sixth edition.*

The third stage cannot be distinguished by the physical signs, so long as the pus remains diffused in the parenchyma, constituting the gray hepatization of Laennec. It presents the same flatness on percussion, and the same respiratory sounds. The supervention, however, of a mucous rale upon the bronchial respiration might sometimes lead to the suspicion, that the concrete exudation with which the cells are filled in the second stage, has been replaced by the pus of the third stage. Should an *abscess* have formed, and opened into the bronchia, a gurgling rale, if the cavity contain a liquid, and pectoriloquy, with cavernous respiration, if it be empty, will be the diagnostic signs.

To revert to the ordinary symptoms, should the disease yield to treatment in the congestive stage, as it sometimes begins to do on the second, third, or fourth day, the pain disappears, the expectoration becomes more copious and more of the character of ordinary mucus, the frequency of the pulse and other febrile symptoms diminish, the tongue begins to clean, and convalescence may be established in less than a week; though the disease may run on for two or three weeks, before all the symptoms disappear. A fatal result very seldom happens in this stage, and only when a large portion of the lungs is involved at once. In the great majority of cases, the first stage advances to that of consolidation. This comes on at various periods from the commencement of the attack, but generally in from one to four days, and seldom so late as a week. The change is not marked by any very obvious general symptoms. There may be some increase of dyspnœa, frequency of respiration, fever, and debility, and the countenance may assume a duller expression, and a darker red or more dusky hue. The pain, instead of increasing, is not unfrequently diminished. If the disease now advances, it passes into the stage of suppuration. This happens at a variable period, usually some time in the course of the second week, though occasionally in old persons so early as on the fourth or fifth day, and in other cases not before the end of the third week. There is no certain sign by which the accession of the third stage can be distinctly marked. But, generally speaking, the difficulty and frequency of respiration increase, so that the patient is compelled to lie with his shoulders elevated, or to maintain a half-sitting position; the pain often quite vanishes; the expectoration diminishes in quantity, or becomes purulent, or assumes the appearance of a dark turbid liquid, or ceases altogether in consequence of the debility of the patient, which disables him from coughing up the matter formed; the countenance becomes pale and haggard, and the pulse extremely feeble and rapid; the skin is bathed with a cold sweat; and death occurs, preceded by the rattling of accumulated mucus in the chest, while the mind usually remains clear to the last. Such is often the course of fatal cases; but much more frequently the disease takes a favourable turn in the second stage, perhaps at the end of a week from the commencement; and, in four or five days more, convalescence is established, though not unfrequently the case is protracted to two or three weeks, and occasionally the patient retains one or more of the symptoms for a considerable time, such as cough, dyspnœa, pain upon full inspiration, or a frequent pulse. It has been doubted whether recovery ever takes place from the state of diffused suppuration, usually constituting the third stage: but, when not yet advanced to complete disintegration of the tissue, I can see no impossibility in this result; and the course of the symptoms, such as we occasionally observe them, including night sweats and purulent expectoration, in severe and protracted cases which nevertheless recover, has convinced me of the fact. That when the inflammation terminates in abscess, recovery frequently takes place, cannot be doubted; and the reason obviously is, that abscess is only apt to occur when the extent of inflammation is moderate. Such instances are more frequent than the rarity of abscesses in post-mortem examination might lead us to imagine. Laennec states that he met with more than twenty cases of abscess in one year, all of which recovered except two.

The return to health in pneumomia is frequently marked by the occurrence of certain discharges, or of other phenomena considered critical. Among these is a disposition in the urine to let fall a sediment upon cooling, and, as has been asserted, to coagulate with heat and nitric acid, showing the presence of albumen, which is sometimes very abundant. But Dr. Walshe states that, though albumen may exist in the urine in small quantities at different periods of the disease, his own observations prove that there is no connection between its appearance and the occurrence of convalescence. A return of chloride of sodium to the urine, after its absence during the progress of the inflammation, may be considered a favourable sign. Copious perspiration, diarrhœa, epistaxis and other hemorrhages, cutaneous eruptions, especially herpes about the lips, boils, and large abscesses are also mentioned among the critical symptoms. Relapses are not uncommon in this disease.

Various modifications of the symptoms above enumerated occur, some of which will be noticed under the heads which immediately follow, but others may be more conveniently considered here. In *double pneumonia*, the dyspnœa is usually much greater than when only one lung is affected, the general strength is more depressed, and the countenance more expressive of anxiety. As the pain is often felt only upon one side, the case is liable to be mistaken for single pneumonia; but the physical signs will always enable the practitioner to come to a just conclusion. It should be recollected that, as the dulness may be about equal over both lungs, we are deprived of the advantage ordinarily derived from a comparison of the two sides.

In some cases, the inflammation is situated in the centre of the lung, or at the mediastinum, so that it comes into contact at no point with the exterior surface. The symptoms are, in these cases, the same as in the ordinary forms of the complaint, except that the acute pleuritic pain is wanting. The physical signs here sometimes fail, in consequence of the intervention of the healthy tissue of the lung between the diseased portion and the ear. Perhaps a very expert hand may elicit by percussion the flat sound from its depths; perhaps a very acute and exercised ear may distinguish the far-off crepitant rale through the superficial vesicular murmur; but most operators will be unable to detect the hidden disease by these means. When, therefore, all the ordinary symptoms of pneumonia, including the viscid and rusty sputa, and excepting only the acute pain, are observed in any case in which percussion and auscultation fail to yield any signs, we may conclude that the disease occupies the interior of the lung. Such instances are rarely observed in dissection; for, when the inflammation is sufficiently extensive to prove fatal, it almost always reaches the surface before death. Walshe considers exaggerated normal respiration, in these cases, in the intervening healthy lung, as a sign of some value.

Pneumonia is somewhat modified in its symptoms when it occurs in persons greatly *debilitated by old age* or other cause. It often happens, under these circumstances, that there is no acute pain, and little or no expectoration, and that any matter that may be coughed up wants the appearance which characterizes that of ordinary pneumonia. The only local symptoms are a little cough, dyspnœa, and hurried breathing, with some fever; and even these are sometimes wanting. Great prostration, a small and irregular pulse, sunken features, a pale or livid complexion, and a certain degree of mental aberration may generally be observed, but afford an insufficient basis for a certain diagnosis. The crepitant rale, moreover, is apt to be obscured by mucous sounds, and bronchial respiration is from the same cause less observable; but the dulness on percussion, taken in connection with the other phenomena, will be sufficiently distinctive. This form of the disease is very fatal. The patient sometimes sinks with great rapidity; and cases now and then occur, in which the system never efficiently reacts after the depression of the chill. The cases denominated *hypostatic* have something of the same character. They arise from a mechanical congestion, consequent upon a long-continued position upon the back, in states of great debility. A low inflammation is produced, with few of the general signs; and the physician has to rely chiefly on the absence of the respiratory murmur, the occasional presence of bronchophony, and the flatness on percussion. The same remarks are applicable to the pneumonia which sometimes comes on near the termination of other diseases, and occasionally at the very close of life. Inflammation of the lungs is often complicated with other pectoral diseases, and especially with bronchitis, pleurisy, and pericarditis.*

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* Besides the varieties of pneumonia described in the text, there are others, distinguished less, perhaps, by anatomical characters than by their origin and nature, which require a brief notice. They may be considered as modifications of the first variety of the text, or lobar pneumonia.

Rheumatic Pneumonia. Gouty Pneumonia. These are forms of the disease recognized by several writers, and of the existence of which I have no doubt. In this work, it is taught that rheumatism and gout are constitutional affections, capable of expressing themselves in local inflammation of a peculiar character in any one of the tissues, though more disposed to seize on the fibrous, as the joints and muscles, than on any other. There is no doubt that pneumonia is an occasional attendant on acute rheumatism, and adds to the danger from the heart affections in that disease. There is, I think, as little doubt, that acute rheumatism sometimes shows itself in the form of pneumonia, as an original affection; and the same may, I believe, be said of gout. I am, however, aware of no special symptoms, whether rational or physical, by which pneumonia of this origin can be distinguished from the ordinary lobar form of the disease. But inflammation of the lungs, alternating with attacks of external rheumatism, or paroxysms of gout, may fairly be assumed to be of this character; and, even without such alternation, if simply occurring in rheumatic or gouty persons, would probably be so. On the whole, this form of pneumonia may be considered milder than the ordinary disease, generally of the sthenic character, indisposed to pass into the suppurative stage, and, therefore, less likely to end fatally, unless, possibly, from overwhelming violence of the congestion at its onset.

Catarrhal Pneumonia. This term is applied to cases either originating in catarrh, or having a certain superficial character similar to that of catarrhal affections. Under the first of these divisions would be included the vesicular pneumonia treated of in the text, the vesicular bronchitis of Rilliet and Barthez. The latter embraces certain mild cases of pulmonary inflammation, occurring especially under epidemic influence, which can scarcely be ranked with bronchitis, and yet want the full characters of ordinary pneumonia, and may be considered, perhaps, as intermediate between these affections. Among the earliest and most characteristic symptoms are often neuralgic or rheumatic pains in the side, having no immediate connection with the pulmonary lesion; as they sometimes occupy both sides of the chest, or, if confined to one, perhaps not that of the diseased lung. There is usually a slight chill or succession of chills, followed by a moderate fever, of a remittent character, with considerable oppression, a cough somewhat paroxysmal, and a mucous expectoration, scanty at first, but afterwards more copious, and only in the smaller number of cases stained with blood. The countenance has an expression of dejection, with some redness of the cheeks, but without the dark-red suffusion so often met with in pneumonia. The tongue is but slightly furred. The whole aspect of the case is that of mildness. Its duration also is short, except that convalescence is often protracted, and attended with a remarkable weakness, recalling one of the prominent characters of influenza. Percussion is dull, and the vocal vibration observable; but both in a less degree than in ordinary pneumonia. The rale heard in auscultation is rather finely subcrepitant than strictly crepitant, though, like the latter, generally confined to inspiration, and is

2. *Lobular Pneumonia.—Infantile Pneumonia.*—The diagnosis of this variety of pneumonia is much more obscure than that of the preceding. It occurs, as shown conclusively by Dr. Gerhard, most commonly in children under the age of six; and, though it may in some rare instances be observed in adults, it may be emphatically entitled the *pneumonia of infancy*. After the age mentioned, the disease almost always assumes the common or lobar form. (*Am. Journ. of Med Sci.*, xiv. 330.) The age of the subjects has a great effect in embarrassing the diagnosis in lobular pneumonia. Children seldom expectorate, or at least they are apt to swallow what they raise from the lungs, so that the pulmonary secretions are not brought to light. It is difficult to ascertain whether they have pain, and what is the seat of it; and their constant movement and frequent cries often render the results of percussion and auscultation uncertain. Besides, the symptoms of the disease itself are often obscure. The matter of expectoration, when visible, instead of having the peculiar properties of that of ordinary pneumonia, rather resembles the mucus of catarrh. Pain is often wanting. The disease too is very often a mere consequence of other diseases, and is apt to escape especial notice, because the attention of the physician has received another direction. It has not unfrequently been unknown, and even unsuspected, until revealed by dissection after death. It is probable, however, that many of the cases which have been considered as pneumonia only upon post-mortem examination, were, in fact, merely instances of the fetal consolidation of the pulmonary tissue, described by Bailly and Legendre, and referred to under the head of the anatomical characters of the disease. (See *page* 7.)

Sometimes the disease begins frankly with fever, hard cough, hurried breathing, and pain indicated by the crying of the child when he coughs. But much more frequently the disseminated points of inflammation are at first insufficient to bring the constitution into decided sympathy, or the slight symptoms produced are confounded with those of some previously existing disease, such as catarrh, measles, hooping-cough, &c. But, when the complaint is somewhat advanced, fever sets in, with a very rapid pulse, frequent respiration, flushed face, contraction and expansion of the alæ nasi, often great restlessness, and a frequent and sometimes painful cough, in some instances hard and dry, in others loose, but generally without expectoration. The pulse is scarcely ever under 120, sometimes as high as 140, 160, or even 180 in the minute, but usually regular. The number of respirations varies ordinarily from 40 to 60, or 70, but is sometimes considerably greater, and has been known to exceed 100. If the complaint now advances, the powers of the system begin to fail, and the cough becomes feeble or quite suppressed. The voice can scarcely be heard; the cries grow faint or cease altogether; the pulse becomes exceedingly small and weak, the respiration irregular and sometimes interrupted with deep sighing, the extremities cold, the face pale or livid; and death soon takes place, usually preceded by a period of drowsiness or stupor. Should the disease, on

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usually heard over but a small portion of the lung. It is, moreover, fugitive, occurring, as it were, in puffs, is rarely mixed with sibilant, and still more rarely with mucous rales, and, in the majority of cases, continues to the end. Bronchial respiration is heard in less than half the cases, when it occurs is soft though high-toned, and very different from the tubal sound of common pneumonia, and is confined to a space scarcely exceeding that of the palm of the hand. It is usually of short duration, often lasting less than twenty-four hours, and is followed by the subcrepitant sound of resolution, though moister than this sound usually is. These rales are gradually exchanged for the mucous, or disappear altogether; though sometimes recalled at a later period in convalescence by efforts at coughing; and it is worthy of observation that, under these circumstances, tonics and a good diet will cause them to disappear. For most of the statements in this brief account of catarrhal pneumonia, I am indebted to a paper by M. Ferrand, in the *Archives Générales* (Juillet, 1862, p. 67). They are, I believe, of considerable value, and will probably be recognized by most practitioners as representing a mild pectoral disease which they have occasionally met with, especially during the prevalence of influenza. (*Note to the sixth edition.*)

the contrary, take a favourable turn, all the symptoms begin to improve in about a week, more or less, and the child gradually returns to health. The duration of the disease is almost always longer than that of the ordinary form of pneumonia, often extending to two or three weeks before death or recovery Sometimes it is much more protracted. Occasionally abscesses are formed and, discharging suddenly, either overwhelm the lungs and produce sudden death, or are followed by purulent expectoration, severe cough, night sweats hectic fever, and emaciation, until at length the child sinks exhausted, or, as sometimes happens under judicious treatment, returns gradually to health after a struggle of several months' duration.

In the earlier stage of the disease, the physical signs often fail entirely to detect it; but at a more advanced period, they become important and even indispensable aids to a just diagnosis. The crepitant rale is rarely heard, being covered by the mucous sounds which are always audible in a greater or less degree. The most characteristic auscultatory sign is the subcrepitant rale, which is usually heard throughout the complaint, here and there all over the lungs, and is sometimes so fine as to approach closely to the crepitant Should the proper crepitation of pneumonia be detected in distinct spots on the chest, with healthy respiration around them, it would be a clear indication of the nature of the complaint. In the advanced stages, bronchial respiration may be heard in the upper part of the lung, and there is an unhealthy resonance of the cry over the chest, which is one of the characteristic phenomena. Dr. Gerhard describes, as a peculiarity of this form of pneumonia, a modification of the respiration, consisting in "a short, obscure blowing" inspiration, "almost without the vesicular murmur," with an indistinct expiration. (*Am. Journ. of Med. Sci.*, xv. 100.) Percussion, which is wholly useless in the early stage, now becomes a valuable sign. There is dulness, and often perfect flatness, on the posterior part of the chest, usually equal on both sides. Should the operator be doubtful, in consequence of the equality of the sound on the two sides, and the want of a point of comparison, he may compare the sounds elicited with those of a healthy chest. Both in auscultation and percussion, he should direct his examination especially to the posterior part of the chest. In some cases of the disease, especially those occurring in the course of chronic complaints of debility, the general symptoms are so very slight and uncertain, that the physical signs afford the only positive evidence of the existence of the affection.

8. *Bilious Pneumonia.—Bilious Pleurisy.—Miasmatic Pneumonia.—Malarial Pneumonia.*—Pneumonia is not unfrequently associated with symptoms of bilious derangement. These may arise from different causes. When the inflammation occupies the lower portion of the right lung, an irritant if not inflammatory action is sometimes extended to the upper portion of the liver and the symptoms of pneumonia become complicated with those of hepatitis or at least of deranged hepatic function, such as pain and tenderness on pressure in the right hypochondrium, pain in the right shoulder, nausea and vomiting, yellowness of the eyes and skin sometimes amounting to jaundice, and deep-coloured, yellowish-brown urine. In other cases, a similar complication occurs in consequence of pneumonia supervening upon hepatic disease, as not unfrequently happens during the colder seasons in malarious countries.

But by far the most frequent form of bilious pneumonia is that which occurs as an associate of remittent or intermittent miasmatic fevers, and which may, with great propriety, be distinguished as *miasmatic pneumonia*. This is a very common disease in the miasmatic regions of the United States; and is especially prevalent in the cold seasons, in the low-lying parts of the western and southern sections of our country. The pneumonia may either be secondary, making its appearance after the fever has set in, or it may be pri mary, and, by the disturbance which it excites in the system, call the pre-existing tendencies to the miasmatic fever into action. It occurs usually in the latter part of the autumn, in the winter, or in the early spring months, and appears to be caused by vicissitudes of the weather, acting on a predisposition acquired by exposure to malarious influences during the summer and early fall. It is most frequent and fatal in seasons which follow an unusual prevalence of bilious fever. It is very common among the black and coloured population of the South. The name by which this complicated disease has perhaps been most generally known in our country is *bilious pleurisy*. From the frequency of acute pain at the commencement, there can be no doubt that, as in ordinary pneumonia, the disease of the lung is often attended with inflammation of the pleura; and it is possible that, in some instances, the inflammation may be confined chiefly to that membrane; but generally the lungs are most deeply involved, as shown by the bloody expectoration, the physical signs during life, and the results of post-mortem examination.

The pectoral symptoms and physical signs do not materially differ, in this form of pneumonia, from those already described as characteristic of the uncomplicated disease. It is not necessary, therefore, to repeat them. The peculiarities are those derived from the miasmatic complication. In those cases in which the fever is the primary affection, the chill and febrile symptoms generally precede those proper to the pneumonia for one, two, or three days, and sometimes a longer period. In other instances, the pneumonia and bilious symptoms pursue an even march. When the complicated disease is established, we have usually, besides the signs of pulmonary inflammation, more or less of the following symptoms: viz., headache, a yellowish or yellowish-white fur on the tongue, nausea and vomiting sometimes of bile and sometimes of the ordinary gastric fluids, a more or less yellowish tinge of the skin and conjunctiva, often a brownish colour of the face arising from the mixture of the pneumonic redness with the icterode hue, and a deep-coloured, yellowish-brown urine. The fever is always remittent, generally with daily paroxysms, which, however, are often more severe on the alternate days; and occasionally the remission is so considerable, that the disease appears almost in the form of a quotidian or tertian intermittent. In the latter case, we may consider any existing fever in the intervals as sustained by the pulmonary inflammation. The grade of inflammatory action is in general less elevated than in ordinary pneumonia, and sometimes the fever assumes a typhoid character; the pulse becoming feeble, the tongue brown and dry, and the mind often somewhat wandering. In such instances, the expectoration is apt to be less adhesive and plastic than in ordinary pneumonia, consisting rather of a bloody mucous or serous *liquid* than of fibrinous exudation. The cases of intermittent pneumonia, spoken of by writers, belong to this variety of the disease. Under proper treatment, bilious pneumonia generally terminates favourably; though, it may prove very fatal, when associated with the more malignant forms of miasmatic fever.

4. *Typhoid Pneumonia.*—Occasionally pneumonia, occurring in persons with enfeebled constitutions, or who have been exposed to certain depressing influences calculated to impair the condition of the blood, puts on that character of feebleness and depravity, which, for want of a better term, is usually denominated typhoid. More frequently, perhaps, it is developed in the course of an attack of typhus fever, or other malignant disease, which necessarily influences the nature of the local affection. In either of these cases, the pulmonary inflammation is distinguished by the name of typhoid pneumonia. It was a mistake to attach the title of *pneumonia typhoides*, as was done by some of our medical writers, to the malignant epidemic which prevailed in many parts of the United States, between the years 1807 and 1820. It is true that the disease was in many instances attended with pneumonia;

but so also was it attended with other inflammations, and very frequently ran its whole course without any inflammation whatever. It was properly typhus fever, and the pulmonary affection was merely an incidental accompaniment. In all such cases, we may speak of the pneumonia as typhoid, but we must guard ourselves against considering it as the main disease, and especially against the practical error of treating it as such.

In typhoid pneumonia, most of the local symptoms do not materially differ from those of the disease in its ordinary form. There are pain, dyspnœa, and cough; and the pain may be either acute or obtuse; but there is occasionally this peculiarity, that severe neuralgic pains are superadded, which are not necessarily confined to the exact seat of inflammation, but may be felt even on the opposite side, and sometimes extend beyond the chest, down the back or sides, and even to the extremities. In many instances, however, painful sensations are quite wanting; and the local symptoms are in general masked, to a considerable degree, by the obtuseness of sensibility consequent upon the state of the brain. Another very striking peculiarity is the character of the matter expectorated. Even in the early stage, it is generally bloody, and sometimes almost pure blood. In all stages, it is less viscid, and usually more copious than in ordinary pneumonia. Not unfrequently it is brown or even blackish, and sometimes fetid. Either from want of energy in the vessels, or from the character of the circulating blood, there appears to be an oozing of this fluid, little changed, through the capillaries, instead of the somewhat plastic lymph that is exuded in vigorous inflammation. The general symptoms are those of depression. The pulse, though sometimes sufficiently full in the beginning, is weak and readily compressible, and sinks rapidly under the loss of blood. Further on in the disease, it is frequent, small, and very feeble. The skin is hot and dry, or cold and clammy, and not unfrequently covered with petechiæ. The pneumonic flush of the face, if existing, is dark and dusky. The tongue is covered with a brownish fur, and in the advanced stages is dry; while the teeth, gums, and even lips are often incrusted with a dark sordes. The evacuations are generally dark and offensive. There is throughout an obtuse condition of intellect, often expressed in the countenance, and degenerating towards the close into stupor or low delirium. The physical signs are dulness on percussion, and the loss of the respiratory murmur, with little or none of the crepitant rale, the place of which is supplied by the mucous sounds, or those arising from diminished caliber of the tubes. The consolidation of the lung is most commonly found in the posterior portion of the chest. Drs. Graves and Stokes have observed, in certain cases of pneumonia, especially of the typhoid form, a tympanitic sound of the chest succeeding dulness, and accompanied with an absence of respiratory murmur, which they ascribed to air in the cavity of the pleura (Stokes, *Diseases of the Chest*, p. 383); and a similar case occurred to myself in the Pennsylvania Hospital, not precisely typhoid, though with a feeble state of system, in which the tympanitic sound extended above the nipple. This patient recovered. Recovery, though not unfrequent, is generally slower than in the sthenic forms of the disease; and the solidified portion of the lung is longer in undergoing resolution.

This affection occurs most frequently in the course of malignant epidemics; but sporadic cases of it are now and then observed, as, for example, under those influences which produce a scorbutic state of system, or from the action of the sedative and poisonous gases, among which sulphuretted hydrogen is perhaps the most deleterious.*

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* Dr. Samuel Gordon, of Dublin, describes a variety of *typhoid pneumonia* having peculiar characters which render it worthy of notice. From his account, it would appear not to be uncommon in Ireland, often occurring epidemically, and sometimes supervening on other diseases. In some cases, the attack is extremely violent, with great prostration at

5. *Chronic Pneumonia.*—This is comparatively rare, and some doubts even of its existence have been expressed. But cases of protracted disease of the lungs following acute pneumonia, and running on for months or even years, do occasionally occur; and physical exploration shows that, in these cases, the lung still remains consolidated in the situation of the original hepatization. In a case of this kind occurring in a young woman under my care, the disease was confined exclusively to the upper lobe of the right lung, which was in no degree tuberculated. There is occasionally pain in the part affected; but it is seldom steady, and is often quite wanting. There is always, however, when the disease is at all extensive, more or less dyspnœa, which is occasionally considerable, and is greatly increased by exertion. In the case of a female which occurred to me in the Pennsylvania Hospital, in whom the whole of one lung appeared to be consolidated, it was the only prominent symptom. The cough is usually moderate, either with or without expectoration, and the matter thrown up is mucus or pus, but not viscid or rusty. There is generally some frequency of pulse, with a little febrile heat towards evening. The appetite is impaired but not lost. The patient has usually sufficient strength to enable him to walk in the apartment, and sometimes to keep about. Occasionally hectic symptoms set in, and pus is expectorated in considerable quantities. When tubercles are not generated, there may always be hope for the patient. The physical signs are dulness or entire flatness on percussion, the absence of the respiratory murmur, and, when the consolidation is extensive, the want of all respiratory sounds, and even of vocal resonance in the distant parts of the lung. But, near the borders, bronchial respiration and bronchophony may be heard, and the hand upon the chest perceives

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the commencement. The symptoms are hurried diaphragmatic respiration, with little cough; often pain in the side, not always referred to the real seat of disease; a small, feeble, and very frequent pulse; coldness of the surface, with purple lips, and a dark suffusion of the face; and great general prostration, ending often in fatal collapse. This condition, however, occurs only in persons previously enfeebled. In ordinary cases, there is little heat of the skin, which has a yellowish hue; the cough is short, frequent, without effort, and wholly different from that of ordinary pneumonia; there is seldom expectoration, and when it does occur, the sputum is not tenacious; the pain is not severe, never sharp as in pleurisy, and often referred, as in the cases of collapse, to a part of the chest where there is no other evidence of disease; the pulse is seldom very frequent, always feeble, and soon acquires a jerking character; constant vomiting is a frequent symptom; and, in addition, there are complete anorexia, great thirst, restlessness, want of sleep, and often considerable modification of the voice, amounting sometimes to aphonia. The physical signs are dulness on percussion, feebleness of the vesicular murmur, ending in bronchial respiration and bronchophony, without the crepitant rale at any stage. If the patient recovers, the bronchial sounds rapidly, sometimes within twenty-four hours, give way to the vesicular. The progress of the affection is rapid, and if it does not end favourably, the lungs seem to pass into a state analogous to gangrene, effusion takes place into the bronchia, and the patient dies of asphyxia.

The lung, after death in the early stages, has at first a dark-blue colour, which disappears in three or four hours, is firm like muscle, heavy, and sinks in water, but presents no appearance like that of hepatization, and never crepitates. If death takes place at a somewhat later period, the lungs are tough, heavy, and, when cut, of a light-gray colour. In the advanced stage, they are of a dirty-gray, softened, and apparently in the commencement of decomposition, but with no well-marked suppuration.

A marked feature of the disease is that it is "not amenable to any of the usual modes of treatment." Bleeding, tartar emetic, and mercury are useless, or worse than useless. Wine and other diffusible stimulants are useful by supporting strength, but have no control over the disease. Sulphate of quinia is the great remedy. Under its use, if resorted to before effusion, the patients always recover, and, even after the commencement of collapse. are sometimes saved. The average dose is five grains every three hours.

Dr. Gordon considers these cases to be characterized by the seat of the inflammation being essentially in the pulmonary capillaries, which become engorged with imperfect fibrin, and are thus disabled from carrying on the pulmonary circulation. (*Dublin Quarterly Journ.*, Aug. 1856, p. 96.)—*Note to the fifth edition.*

a decidedly stronger vibration from the voice than upon the healthy side. In favourable cases, the return of respiration is generally first perceived in the upper portion of the chest, and gradually extends downward with the resolution of the solidified lung.

A variety of chronic pneumonia has been described, characterized by the conversion of the interlobular areolar tissue into an indurated structure, causing contraction of the lung, obliteration of the air-vesicles, and sinking in of the side. It is the "cirrhosis" of Dr. Corrigan, and is probably rather fibroid degeneration than the result of inflammation. It will be more particularly described among the non-inflammatory organic affections of the lungs.

Diagnosis.

The diseases with which pneumonia is most liable to be confounded are bronchitis, pulmonary œdema, pleurisy, and certain states of phthisis. It will be sufficient here to mention the characters by which the disease may be distinguished from bronchitis. In reference to the other affections, the reader is referred to the articles respectively in which they are treated of. It is in cases of bronchitis extending to the minute ramifications of the bronchia, that the greatest resemblance is presented to pneumonia. But, in the former affection, the sensations are more those of soreness than acute pain, and are usually seated in the anterior and upper part of the chest, behind and in the vicinity of the sternum; the expectoration, though sometimes streaked with blood, never has the extremely viscid and rusty character of the sputa of pneumonia, and when it once begins is much more copious; no true crepitant rale is heard, but instead of this the dry and mucous rales; there is no bronchial respiration or resonance, and very seldom a permanent want of the respiratory murmur in any part of the chest; and finally there is no considerable dulness on percussion. But not unfrequently the two diseases are combined; and, when the pneumonia is in the centre of the lung, or disseminated, it is sometimes difficult if not impossible to distinguish between them.

Prognosis.

In cases of primary pneumonia, of the common or lobar kind, occupying only a portion of a single lung, occurring in persons of a good constitution, and without complication of any kind, there is every reason to hope for a favourable issue. Cases of this kind almost always end in recovery under proper treatment, and not unfrequently even without remedies, or with such as are improper. The disease appears to be remarkably mild between the ages of six and twenty-one. Of forty cases observed by Dr. Gerhard and M. Rufz, in the Children's Hospital at Paris, occurring in children from six years old to the age of puberty, only one terminated in death. (*Am. Journ. of Med. Sci.*, xiv. 330.) M. Barthez, moreover, has found the uncomplicated pneumonia of children by no means a very serious disease; as, out of 212 cases treated by him in the hospital, only two proved fatal, and in both of these the pneumonia was double. Nor did he ascribe the result to the treatment, at least except negatively, as one-half were not put under treatment at all, and in not more than one-sixth of the cases was it deemed expedient to have recourse to active remedies. (*Med. T. and Gaz.*, May, 1862, p. 490.) In debilitated persons, and in those above fifty years, the disease is much more fatal. In very advanced age, it is extremely dangerous. It is said to be more unfavourable in its termination in the upper than in the lower lobes. The danger is much increased when the whole of one lung is affected, and in double pneumonia is always very great. In subjects having the tuberculous or scrofulous diathesis, pneumonia is sometimes attended with copious tuberculous deposition, which, under these circumstances, may be considered as inevitably fatal, and often runs a very rapid course. Secondary pneumonia is more fatal than the primary, and the lobular than the lobar variety; but the greater danger of the lobular, independently of the fact that it is more liable to escape notice, and therefore not to be treated properly, is owing to the circumstances, that it is generally secondary, and apt to occur in debilitated constitutions. In bilious pneumonia, the fatality probably depends more upon the febrile disease, of which it is a mere accompaniment, than upon the pulmonary inflammation. Though it generally yields very happily to remedies, yet, if improperly treated, it is sometimes extremely dangerous, especially in cases in which a malignant or pernicious tendency complicates the disease. The same remark may be made of typhoid pneumonia. When associated with a malignant epidemic it is often very fatal. But when originating in local or accidental causes, it may be comparatively mild. It has occurred to me to attend between twenty and thirty persons of various ages, from childhood to middle life, in an institution in Philadelphia, all affected in one season with typhoid pneumonia of various grades, and all of whom recovered. The cause of the disease, so far as could be ascertained, was an excessively offensive exhalation which filled the whole house, and proceeded from a cellar into which the contents of a privy had been discharged by the giving way of a separating wall. But the mortality of typhoid pneumonia depends much on its management. If treated with the same energetic depletion which is adapted to the ordinary form of pneumonia, it may be enormously fatal. Herpes occurring in the course of the disease may be regarded generally as a favourable sign, though it appears sometimes in cases which end fatally.

In any case of pneumonia, an exceedingly hurried respiration, inability to lie down, very dark and consistent, or thin brownish or blackish, or fetid expectoration, copious diarrhœa or colliquative sweats, and an extremely frequent, feeble, or irregular pulse, amounting in the adult to 140 in the minute, are all very dangerous symptoms.

Causes.

Vicissitudes of the weather are among the most frequent causes of pneumonia. Sudden exposure to cold, when the body is warm and perspiring, is very apt to induce it. This is especially the case, when the individual exposed is at the time labouring under a catarrhal attack. Direct violence, acrid or poisonous inhalations, the excessive use of the voice, violent exertion of any kind which accumulates the blood in the lungs, powerful emotions, excesses in drinking, the suppression of habitual discharges, the retrocession of gout or rheumatism, and the sudden disappearance of cutaneous eruptions are ranked among the occasional causes. A long-continued position upon the back is said to give rise to the disease in debilitated persons. It sometimes follows accidental injuries, or surgical operations of a severe character; at least, abscesses in the lungs have been observed under these circumstances, though it may be doubted whether they are not rather the result of purulent infection of the blood, than of proper pulmonary inflammation. Various diseases are apt to be accompanied with pneumonia, and are thought to favour its production. Among those in which it most frequently occurs is bronchitis; but it is also frequent in measles and hooping-cough. It is an occasional attendant upon small-pox, scarlatina, and erysipelas. Phthisis can scarcely run its course without more or less of it. Affections of the heart not unfrequently occasion it, by the pulmonary congestion to which they give rise. It is not uncommonly associated with organic disease of the kidneys, and under these circumstances, has been observed by Dr. G. B. McDowel, of Dublin, to have a tendency to the suppurative or gangrenous condition. (*Dub. Quart. Journ.*, May, 1856, p. 322.) It is not unfrequent in enteric or typhoid fever, and is occasionally associated also with the miasmatic and typhus fevers. Chronic diarrhœa appears to predispose to it in young children. (*Gerhard.*) It is one of the most common inflammations which attend reaction after the collapse of cholera. It is occasionally epidemic, but probably only as an associate of other diseases.*

Of the predisposing causes, cold may be ranked among the most efficient. Hence, the disease prevails most in cold countries, and in the colder seasons. It is probably as common in cold and dry as in moist climates. It is not uncommon in the mountainous regions of this country. It is especially apt to occur towards the end of winter, and in spring. Those occupations are believed to predispose to it which expose the lungs to injury from over-exertion, or the inhalation of irritant substances, and which render necessary an exposure to the vicissitudes of the weather, without due protection. Some persons have a peculiar tendency to the disease, without any known cause, and suffer from repeated attacks. Age and sex do not appear to have any very considerable influence over its frequency. In the first five or six years of life, it is not uncommon; but it is then apt to be connected with other diseases, which are probably its real causes. Perhaps the period of life at which it is most frequent is from 20 to 30 or 35, when the body has attained its full height, but is still spreading laterally. The disease is more frequent in men than women; but the reason of this probably is, that the former are more exposed to the vicissitudes of the weather and to other exciting causes.

Treatment.

In no disease is it more important to make a proper discrimination in the treatment. The measures which are salutary and even essential under certain circumstances, are injurious and may be fatal under others. In order to make the importance of this distinction in the mode of practice more obvious, it will be best to treat, under distinct heads, of the varieties of the disease which most differ in the measures they require.

1. *Common Pneumonia.*—In persons with vigorous constitutions, bleeding is the most efficient remedy. No disease bears the loss of blood better than open, well-developed pneumonia. This evacuation is called for, not only in reference to its direct effect in relieving inflammation, but also with the view of diminishing the labour of the lungs, and thus procuring rest for the diseased organ, so far as this is possible. As all the blood in the body must pass through the lungs after reaching the heart, before it can be again distributed, and as in pneumonia a considerable portion of the lungs performs the duty but imperfectly, a greater burden necessarily falls upon the remainder; and thus, not only is the sound part of the lung unduly loaded with blood, but the movements of respiration must be accelerated in proportion. By diminishing the amount of blood, we relieve the lung of a portion of this duty. In deciding upon the quantity to be taken, we must be guided by the stage of the disease, the state of the pulse, and the constitution of the patient. In a vigorous patient, in the earlier stage, with a strong pulse, and before hepatization has decidedly commenced, from sixteen to thirty ounces may be taken at the first operation. There is some reason to hope, in this stage, that we may arrest the progress of the disease by decided measures. I am entirely certain that I have witnessed this result in my own practice. Should the symptoms have in no degree abated, we may bleed again at an interval of from twelve to

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* From the observations of Dr. Woillez, it appears that in most acute febrile diseases there is an attendant pulmonary congestion, evinced by expansion of the chest with diminished elasticity, feebleness of the respiratory murmur with or without sonorous rales, and some degree of dulness on percussion, especially behind. The sonorous rales he conceives to be much more frequently a sign of congestion than of bronchitis. This condition of the lungs may readily pass into inflammation, and hence the not unfrequent occurrence of this affection in acute febrile diseases. (*Archives Gén.*, Mai, 1854, p. 578.)—*Note to the fourth edition.*

twenty-four hours, and the operation may even be again repeated, should the pulse not have been reduced, nor the inflammatory symptoms decidedly checked. In the subsequent bleedings, it will seldom be proper to take as much as at the first; but the pulse and general condition of the patient must be the guides. The occurrence of nausea or faintness, while the patient is bled in the sitting posture, should be a signal to stop the discharge. Cases sometimes occur in which the loss of blood is necessary, though the pulse may not seem to indicate it. The lungs are overwhelmed with the sudden and extensive congestion, and the function of respiration consequently so much impeded as to occasion a partial asphyxia, in which the surface becomes pallid or purplish, and the pulse very small, frequent, and feeble, suggesting the idea of great prostration of the vital forces. In these cases, however, the fault is not in debility, but in excessive action in a vital organ; and the remedy is not stimulation, but abstraction of blood. It is proper to excite the surface by irritants; but the important object is to unload the lungs. It generally happens that the pulse rises under the lancet, and this affords an indication that the remedy has been rightly employed. There may be difficulty in discriminating between such cases and those of true debility. Should the apparent prostration come on suddenly in the first stage, when no typhous epidemic is prevalent, in persons previously in tolerable health, and the respiration exhibit evidences of great oppression, it is much the safer plan to treat the case as one of active pulmonary congestion, and to try the lancet. Should the pulse become still weaker, the bleeding must be stopped; but should it rise, the operation ought to be continued until the symptoms are relieved, or the patient can bear no further loss. Laennec proposes, as a test of the propriety of bleeding under such circumstances, the application of the stethoscope to the heart. Should the cardiac pulsation be found proportionably much stronger than the arterial, he considers it an indication that bleeding is proper.*

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* The reader is probably aware that a controversy has been carried on, of late years, in relation to the value of bleeding in the treatment of pneumonia. After carefully considering what has been said on the subject, and guided by the lights of my own experience and observation, I have seen no reason to change what has been said in the text. It will have been perceived that I am no advocate for indiscriminate or excessive bleeding; but, employed with a due regard to the state of the system, the stage of the disease, and the character of the affection, it is, I believe, a most valuable remedy, capable, in many instances, of saving life, and not likely to endanger it in any. I cannot recall a case of uncomplicated pneumonia, in which I was able to use the lancet, under the circumstances mentioned, which did not eventuate favourably; while I have often had occasion, when prescribing for cases in the advanced stage, to regret that it had not been employed. One case is prominent in my recollection, that of a young lady, whose parents had an unfortunate predilection for homœopathy, and to whom I was called merely in time to see her die, a victim, as I fully believed, to a neglect of proper depletion in the early stage. But it should be remembered that many cases are so mild that bleeding may be dispensed with, as, indeed, may all other treatment; and others are of such a character, in consequence of old age, the asthenic state of the patient, or complication with typhoid tendencies, as to contraindicate all reducing measures, and, indeed, to call for support.

Perhaps the strongest evidence against the necessity of the lancet is that given by Prof. J. Hughes Bennett, of Edinburgh. In the Royal Infirmary at Edinburgh, Prof. Bennett had the opportunity, in the course of about six years of service, of treating 129 cases of acute pneumonia, of which only 4 proved fatal, and those complicated. The treatment was mainly supporting, consisting in the moderate use of wine and nutritive food; while antimonials, acetate of ammonia, sweet spirit of nitre, &c. were used when apparently indicated, and occasionally recourse was had to leeching and blistering, and in a few instances, 9 in all, to venesection. Now it appears to me that all that can fairly be inferred from this statement, is that the pneumonia, prevailing among the poorest classes of people at Edinburgh, is eminently a mild disease, requiring, in consequence of the general existing asthenia, a supporting treatment. In the text, I have alluded to a similar experience of my own, on a smaller scale, in which between 20 and 30 cases of pneumonia occurred in a public institution, exposed at the time to peculiar asthenic influences, all of which ended in recovery under moderately stimulant measures, not one, to the best of my

After the first bleeding, or immediately if bleeding does not seem to be called for, the bowels should be thoroughly evacuated by an active cathartic, as calomel and jalap, the compound cathartic pill, infusion of senna with Epsom salt, &c.; but subsequently, throughout the case, it will be sufficient merely to keep them open once or twice a day, which may be effected, if necessary, by small doses of a saline cathartic, castor oil, or magnesia, or, what may sometimes be preferable, by enemata. But it very often happens that the remedies employed to meet other indications have the effect of sufficiently loosening the bowels, so that measures are not required for that purpose especially.

The bowels having been evacuated, recourse should be had to small doses of tartar emetic, repeated at short intervals; from the twelfth to the quarter of a grain, for example, every hour or two hours during the day. When the skin is hot and dry, this may be accompanied with the neutral mixture or nitre, if borne well by the stomach. In cases attended with vomiting, the effervescing draught should be substituted for the antimonial.

After two or three days, when the force of the circulation has been sufficiently subdued by the lancet, a mixture consisting of a grain of opium, a grain of ipecacuanha, and two or three grains of calomel, may be given at night, in the form of pill; the treatment above pointed out being continued through the day. Sometimes it may be deemed proper to increase the dose of the anodyne, when the system is not very susceptible to its influence. In such cases, twice the quantity of materials just mentioned may be made into four pills, two to be taken at bedtime, and one at intervals of an hour or two afterwards, until the soporific effect is produced. The advantages of this combination are, that it procures rest for the patient, obviates the injurious effects of the cough, directs action to the skin, and lays the foundation for a mercurial impression, if this should subsequently be deemed advisable.

Should the pain continue after general bleeding has been carried as far as may appear admissible, and especially if the physical signs indicate the unchecked progress of inflammation, blood should be taken by cups or leeches

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recollection, having been bled. Upon a careful examination of the tables given by Dr. Bennett (*Restorative Treatment of Pneumonia*, 3d ed., p. 12), I find that the average time which elapsed between the commencement of the disease and that of the treatment, in all the cases in which the time is recorded, namely 119, was 5·33 days; that, of the whole number, 11 were prescribed for at the end of one day, 6 at the end of two days, and 13 at the end of three; so that, in accordance with the recommendation in the text, even had the cases been of a decidedly sthenic character, venesection would have been employed only in 30 cases; and it is probable that my own practice would not have materially differed from that of the Edinburgh professor, except, perhaps, that I might have used mercury cautiously in some of the worst cases. It is obvious that this experience at Edinburgh should not be a guide for the practitioners of this country, where pneumonia is a much more serious disease, carrying off a large proportion of the population, and, I fear, a somewhat larger proportion now, when the profession seems, in some measure, to participate in the European fear of the lancet, than formerly, when this remedy was more freely resorted to. I find that the number of deaths from inflammation of the lungs, in Philadelphia, in the year 1863, as given by Dr. Wilson Jewell, in his Report to the College of Physicians, was 743, out of 15,788, the whole number of deaths from all causes in that year, or about one in 21.

Prof. Gairdner, now of Glasgow, but formerly of Edinburgh, who was also physician of the Infirmary of the latter city, states that, during five years from 1855 to 1859 inclusive, only 11 deaths from pneumonia occurred, of which but one was an uncomplicated case, and that in an excessively intemperate person. In none of the fatal cases had the antiphlogistic treatment been used: and of 4 or 5 cases, in which the lancet had been employed, all had done well. The disease had been treated on no general system; but such remedies were used as each case seemed to call for, and the loss of blood among the rest when apparently indicated. (*Edin. Med. Journ.*, March, 1860, p. 838.) This is further evidence of the extreme mildness of the disease as it occurred during those years in Edinburgh: valuable, no doubt, as a proof that pneumonia does not always call for energetic treatment, but not to be received as an unquestioned guide to the practitioner, at other times, and in other places. (*Note to the sixth edition.*)

from the chest to an extent corresponding with the strength of the patient. From four to ten ounces may be abstracted in this way, and sometimes with great advantage. Large emollient cataplasms are also sometimes useful; but their use requires great caution, lest they may render the patient liable to cold by improper exposure of the wet surface.

Very frequently, under this treatment, the symptoms of inflammation will gradually subside, and the patient recover without further remedies. But, should the disease prove obstinate, it will be proper to resort to the mercurial impression. The combination of calomel, opium, and ipecacuanha, before given only at night, may now be continued through the day, in smaller doses, repeated at short intervals. The relative quantity of the ingredients must vary according to circumstances; the ipecacuanha being increased or diminished according as it is well borne by the stomach or nauseates it, and the opium and calomel proportioned to the susceptibility of the patient. Generally speaking, half a grain or a grain of calomel, one-quarter of a grain of ipecacuanha, and the same quantity of opium may be given at intervals of one, two, three, or four hours, so that not more than from two to four grains of opium shall be administered in twenty-four hours. When the symptoms are threatening, and a speedy mercurial impression is requisite, three or four grains of calomel with half a grain or a grain of opium may be given every four hours. Sometimes even thus combined, calomel produces purging, and worries the bowels. In such cases, the mercurial pill should be substituted, in proportionate doses, with the same addition. It is important to push the mercurial plan until the gums become somewhat affected, when the symptoms will generally begin to improve. A profuse ptyalism is never requisite; and, as soon as evidence is given, by the state of the gums, that the system is affected with mercury, it should be suspended, or continued in diminished quantities, so as merely to sustain the effect produced, until all symptoms of pectoral inflammation shall cease. It will often be proper to begin the mercurial plan upon the fifth day, if the symptoms have not begun to decline before that period; but the precise time may be earlier or later in any particular case, and must be left to the judgment of the practitioner.

At the same time that this plan is in operation, a blister may with great propriety be applied to the chest. It should be large, not less, as a general rule, than six inches by eight, and often as much as eight by ten. Before this period it would be improper; as, without unseating the inflammation, it might injuriously aggravate the fever. Should the case linger, the blister may sometimes be repeated with advantage.

In the declining stage of the disease, expectorants are often useful. The syrups of squill and seneka may be combined with a little tartar emetic and one of the salts of morphia, and given in such doses as the stomach will bear without being nauseated. If the pulse, as sometimes happens, remain frequent, the tincture of digitalis may be added. Not unfrequently it will be found best to omit the antimonial, in consequence of its depressing properties; and in such cases wine of ipecacuanha may be substituted.

Should the strength fall in the advanced stages, it will often be found very useful to employ carbonate of ammonia, in two and a half, five, or ten-grain doses, at intervals of two hours. Wine-whey may also be added, and, if hectic symptoms should set in, or copious night sweats occur, recourse should be had to sulphate of quinia. Oil of turpentine has also sometimes proved highly useful, given in pretty large doses. The timely employment of moderate stimulants, with a nutritious diet, under such circumstances, has, I believe, often saved life. Gangrenous symptoms may be met with chloride of lime, opium, quinia, and the mineral acids, especially the nitromuriatic.

It is highly important, in the cases of intemperate individuals, not entirely and at once to abstract their accustomed stimulus. It should be diminished, but not quite cut off. Otherwise, delirium tremens would be likely to set in, and the patient might sink under the requisite depletion. In such persons, alcoholic drinks in moderated amount cease to be stimulant. They are only one of the agents requisite to the support of their nervous system at the proper point of elevation. The right plan is to allow the stimulus, and at the same time, if necessary, to bleed. The nervous system is thus supported, while the inflammation is combated.

If pneumonia is not seen until it has reached the stage of hepatization, bleeding should be employed with more hesitation. Still, moderate quantities of blood may sometimes be taken with advantage both generally and locally; and, if there be any doubt about the propriety of the lancet, cups or leeches will usually be proper. It is the continued spreading of the inflammation, as indicated by the extension of the crepitant rale around the borders of the hepatized part that especially demands this treatment. After four or five days, there is little hope of cutting short the disease by direct depletion. It will run its course, and the strength must be husbanded for the future struggle. Fatal consequences have, I am convinced, often resulted from profuse bleeding under these circumstances. Still, as stated, it may be employed in moderation, if called for by the state of the pulse, and of the local symptoms. Nor can copious bleeding always be employed with propriety, even at the commencement. When the disease occurs in persons enfeebled by previous ill-health, or by extreme old age, or when it is associated with diseases of a low grade of vital force, as scarlet fever, malignant erysipelas, &c., the loss of blood is badly borne, and one moderate bleeding is at most all that is admissible. Indeed, it will often be prudent to omit even this, and employ leeching or cupping in the place of it. In very young children, too, local bleeding by leeches is generally preferable.

Such as above described is the course of treatment which I have generally employed in ordinary pneumonia. But other means have been recommended, which it would be improper to pass over without notice. Among these is the use of tartar emetic in large doses. This plan was in modern times introduced by Rasori, of Italy, was subsequently employed and highly recommended by Laennec, and has been much in vogue both in America and Europe. It has undoubtedly great influence over the disease, and, even unaided by the lancet, has probably often effected cures. Some, indeed, have relied upon it to the exclusion of blood-letting. Others bleed moderately once or even oftener in the early stage, and then give the antimonial. Others, again, treat ordinary cases with blood-letting, and have recourse to the antimonial in cases deemed unsuitable for the lancet, and yet demanding a sedative treatment. The antimonial does good probably in various ways. It depletes by its frequent emetic and cathartic effect, acts as a derivative to the alimentary canal from the lungs, and immediately reduces arterial excitement by its powerful sedative agency. Though it generally vomits at first, and often purges, the stomach and bowels not unfrequently become subsequently reconciled to it, so that, in some instances, it scarcely produces nausea in doses in which it originally vomited. Rasori gave it in enormous quantities; for example, from one to three drachms in twenty-four hours, in divided doses. Laennec gave a grain of tartar emetic in three ounces of liquid vehicle every two hours, suspending it in mild cases, after the sixth dose, for seven or eight hours; but, in those of a threatening character, continuing steadily on until amendment was evident; and, in the worst cases, increasing the dose to a grain and a half, two grains, or even two grains and a half. Other practitioners use the medicine in smaller quantities. The safest plan is probably to begin with small doses, and gradually increase to the larger if necessary. From one-quarter of a grain to two grains may be given every two, three, or four hours, in from a fluidounce to two fluidounces of water. The vehicle may be pure water, or water rendered demulcent by gum arabic and loaf sugar, or some mild aromatic infusion. A little laudanum should be added, when the antimonial shows a disposition to produce exhausting purgation. Dr. Williams recommends the addition of a few drops of hydrocyanic acid, if it continue to vomit. Its effect, even when it does not vomit, which occasionally happens even from the beginning, and frequently after the administration of two or three doses, is to produce great depression of the pulse and coolness of the skin, which are often attended with a striking amelioration of the disease. As, if the remedy is now omitted, the inflammation is apt to increase, it is necessary to continue it, though in somewhat moderate quantities, for some days after the beginning of amendment. M. Trousseau prefers kermes mineral to tartar emetic, as less apt to disturb the stomach, and otherwise to produce unpleasant effects. But the antimonial plan is not without its dangers. The depression may be too great, or gastro-intestinal inflammation may be induced, or the patient may be exhausted by the excessive vomiting and purgation. A patient who is put upon its use should seldom be long from under the oversight of the practitioner, as serious evils may happen in the intervals of his visits, if long protracted. The plan is altogether unsuited to cases in which there is already gastro-intestinal irritation. It is, I believe, upon the whole, less manageable than the lancet, and less safe than the mercurial plan, when the lancet is not admissible. Having witnessed fatal effects from the abuse of tartar emetic, I have been from the first averse to the plan; and the result of the few cases in which I had seen it employed has not tended to reconcile me to it. In one instance, it appeared to me to have hastened, if not occasioned the fatal issue. The late Dr. J. F. Peebles, of Petersburg, Virginia, recorded several cases, in which a hemorrhagic tendency seemed to have been generated by the antimonial treatment, which resulted fatally after all signs of the pulmonary inflammation had disappeared. (*Am. Journ. of Med. Sci.*, N. S., xv. 338.) Dr. Boling, of Montgomery, Alabama, repeatedly witnessed death occurring rather suddenly in pneumonia, after a rapid subsidence of the pectoral symptoms, which he ascribed to a translation of inflammation from the lungs to the alimentary mucous membrane, consequent on the irritant revulsive influence of tartar emetic. (*Ibid.*, xxii. 331.) In small doses, it is a safe and useful adjuvant to the lancet; and I have habitually used it in the early stages, when not contraindicated by the existence of nausea or vomiting.

Veratrum viride, or American hellebore, has recently been much used in this country in the treatment of pneumonia, especially in the miasmatic regions, and, according to the reports published in the journals, with extraordinary success. So given as to reduce the pulse to the normal standard, and to maintain it there, without vomiting, it appears to moderate the inflammation, and to a considerable extent to supply the place of the lancet, in those cases in which, from the state of the system, this remedy may be considered of doubtful applicability. For the dose and mode of administration, the reader is referred to the *U. S. Dispensatory*, or the work of the author on *Therapeutics and Pharmacology*. The same, to a certain extent, may be said of the alkaloid veratria, which has been used in Europe, with great asserted success. I do not, however, believe that it exerts on the circulation the same depressing effect, relatively to the dose, as the American hellebore, which, from recent examinations, there is reason to believe possesses a sedative principle quite different from the alkaloid of the veratrum album.

Other remedies, which have been used with asserted benefit in pneumonia, are *acetate of lead*, *hydrocyanic acid*, *digitalis*, *muriate of ammonia*, the *alkalies and their carbonates* in the earlier stage, and *iodide of potassium* in the advanced stage, when the lung remains consolidated, and fever has di appeared. When opium disagrees with the patient, hyoscyamus or coniu may be substituted; and small doses of camphor in addition to opium an ipecacuanha, after due depletion, have been highly recommended. Dr. Mad son, of Petersburg, Va., has found pneumonia to be cut short by the exhibi tion of emetics at the commencement. (*Stethoscope*, iv. 68.)

Varentrapp, of Frankfort, Germany, has employed chloroform by inhala tion as the main or exclusive remedy, with remarkable success, having lo only four and one-third per cent., while of cases previously treated by him i the ordinary mode he had lost fifteen per cent. About sixty drops were place on compressed cotton, and the vapour allowed to enter the lungs, for ten o fifteen minutes; and the dose was repeated every two, three, or four hour It was not permitted to produce unconsciousness. There was a gradual amen ment of the symptoms, which ended in recovery on the twelfth or thirteent day of the disease. (See *Am. Journ. of Med. Sci.*, N. S., xxiii. 517.)

The outward application of cold to the chest is recommended by Pro Niémeyer, of Magdeburg, who has found this remedy to produce a marke amelioration of the symptoms, both in pneumonia and pleurisy, not cuttin short the disease abruptly, but causing an earlier cessation of exudation, an enabling patients to return to their avocations seven or eight days soone than under other treatment. Nor has he witnessed any evil from the remed (*Dub. Hosp. Gaz.*, Jan. 1, 1858, p. 15.)

But the course of treatment would be very imperfect, without attention t various points of management not yet particularized. It is important not t disturb any of those actions which may be considered as critical, but, as general rule, rather to follow the lead of nature, and encourage them. Shoul the disease have arisen from repelled eruptions, or translated irritations o any kind, efforts should be made to restore them to the surface, or exteri parts, by the warm bath, hot pediluvia, and blisters or rubefacients. The pa tient should lie with his shoulders somewhat elevated, and, in protracted o debilitated cases especially, should have his position changed occasionally, i order to prevent the settling of blood into any one portion of the lungs, unde the influence of gravitation. This remark is peculiarly applicable to infant In the physical examination of the chest, care should be taken to expose th surface as little as possible. Percussion should not be made so strongly as t occasion pain. The air of the apartment should be of a uniform temperatu and warm, but purified by sufficient ventilation. In the early stage, the di should be of mucilaginous or farinaceous drinks, such as gum-water, barle water, thin gruel, &c., to which may be added the decoction or infusion of th dried fruits, and the juice of oranges or fresh grapes, the indigestible po tions of these fruits being rejected. At a more advanced period, when th fever has been somewhat subdued, tea and toasted bread or crackers, with little rice or Indian mush, may be allowed; after these, milk; and finally, i convalescence, broths, and the lighter meats, eggs, oysters, &c. In cases o debility, it is highly important to resort to these nutritious substances befo convalescence. There is reason to believe that patients in pneumonia hav sometimes been starved to death.

It would scarcely be just to the existing views on the treatment of pne monia, to pass over without notice the expectant plan, which appears at pr sent to have not a few advocates; but it is very certain that the opinion o these practitioners is based upon a class of cases, not very uncommon in pne monia, in which the disease is disposed to end favourably, and will often d so under almost any kind of treatment, or under no treatment whatever; an it is equally certain that the practice, if generally adopted, and extended t all cases, will be followed by the most deplorable consequences. It is bette

I think, to run the risk of unnecessary treatment, which, in judicious hands, can seldom be hurtful, and may often give material aid to the efforts of nature, than to neglect needful measures in the serious cases, of which the lists of mortality alone give fearful evidence that the numbers are very large.

Lobular or Infantile Pneumonia.—There is nothing so peculiar in this form of pneumonia as to call for a different set of remedies. The treatment is to be conducted upon the same general plan as in the ordinary variety. But reference must be had especially to the origin of the disease, and the strength of the patient. Arising frequently in debilitated subjects, and in the course of other diseases, it will not, in many instances, bear the depletory measures so strongly called for in the more frank and uncomplicated cases. The age of the subject also requires attention. In very young infants, leeches may be advantageously substituted for the lancet. Emesis is often beneficial; and tartar emetic may be employed for this purpose. It may also be continued afterwards in small doses; but the gigantic plan of administering this remedy, recommended in cases of adults, is too hazardous in children. Calomel is a most invaluable remedy, and may be given in the same combinations as already mentioned. But there is, perhaps, no point in the pneumonia of children, to which it is more important to direct attention, than to the treatment of the advanced stages. Debility is here a prominent character, and often demands the use of stimulants. Carbonate of ammonia, wine-whey, and assafetida, with a nutritious diet, and the addition of sulphate of quinia when hectic symptoms appear, are the chief remedies. A mistake at this stage of the disease, and the substitution of depletory for supporting measures, would prove almost certainly fatal. In cases of the fetal state of lung, simulating pneumonia, depletory treatment is inadmissible, and stimulating and supporting measures are often required.

Bilious Pneumonia.—Miasmatic Pneumonia.—If this owe its peculiarities merely to an association of hepatic with pulmonary inflammation, no modification of the treatment before recommended will be necessary, except that the mercurials should be employed at the beginning, and continued until they affect the mouth. But if the disease be associated, as it generally is in this country, with miasmatic fever, or a miasmatic state of system, it will require other measures. Bilious pneumonia does not bear bleeding so well as the uncomplicated disease; but, frequently, the loss of twelve or fifteen ounces at the commencement is advantageous, and sometimes the operation may be repeated. Much depends upon the grade of constitutional force in the febrile affection. A good plan is to place the patient erect in bed during the operation, and, with the finger on the pulse, to stop the discharge when this begins to falter. When bleeding can no longer be supported, and in cases which do not admit of it, cups or leeches are generally safe and useful. It is best, in cases in which the propriety of the lancet is doubtful, to commence with an emetic, or an emeto-cathartic. For this purpose, a dose of tartar emetic has been prescribed, followed by a purgative dose of calomel; or a mixture of ipecacuanha or precipitated sulphuret of antimony with calomel may be given at first, and the mercurial afterwards carried off by sulphate of magnesia, or a combination of this with infusion of senna. In this affection, when the bowels are not irritable, cathartics into which calomel enters may in general be occasionally employed throughout the complaint, or at least until evidences of debility are presented. Blisters may be resorted to at an early period, and may often be repeated with advantage. In other respects, with a single exception, the treatment may be conducted as in ordinary pneumonia. That exception consists in the early use of sulphate of quinia. Whenever the remission is decided, after the thorough evacuation of the bowels, and the abstraction of whatever amount of blood may be deemed advisable, no matter at what stage the remission may occur, recourse should be had to this medicine, as in remittents without the same complication. By arresting the paroxysm we do infinitely more good, in relation to the inflammation, than the stimulant action of the quinia can do harm. There is no stimulant so powerful as the paroxysm itself, and each recurring one has a strong tendency to sustain the inflammation. Indeed, the pneumonic symptoms are almost always worse in the exacerbation of the fever, and decline as that remits. From twelve to eighteen grains of the sulphate of quinia should be given between the paroxysms, usually in divided doses of one, two, or three grains, according to the length of the interval. Some prefer larger doses, as of five grains; and these should be given where it is necessary to produce a speedy impression. Should the disease put on, as it not unfrequently does, a typhoid character, this medicine becomes still more proper, and in malignant or pernicious cases it is absolutely indispensable. In these latter cases, it must be administered unsparingly; for it is of the utmost importance to prevent the recurrence of the paroxysm. The quinia may often be advantageously combined with calomel, opium, and ipecacuanha. Very commonly, the pneumonia subsides along with the fever, and requires little further treatment when the paroxysms have been superseded. Should it remain, however, it may then be managed as if an original affection. Should the disease be intermittent, the propriety of employing this remedy is still more obvious. In low cases, it may be necessary to stimulate as in the following variety.

Typhoid Pneumonia.—Bleeding is not usually well borne in this variety of the disease, and, if pushed far, is not unfrequently fatal. Occurring generally as an attendant upon malignant epidemics, and assuming in its onset features which to the inexperienced eye are not strikingly different from those of ordinary pneumonia, it is apt to be treated at first in a similar manner, by blood-letting and other evacuants, until the practitioner becomes alarmed by its terrible fatality, and finds it necessary to change his measures. When there is doubt as to the nature of the disease, in any particular case, attention should be paid to the character of any epidemic that may be prevalent in the same or some neighbouring region, and, if this be typhous, great caution should be exercised in the use of the lancet. In some cases, a moderate loss of blood may not be unsafe, and may even be advantageous; but these are to be considered as rather the exceptions than the rule; and, in general, leeching or cupping is the most that should be done in the way of direct depletion. The best plan is usually, if the disease is seen in its earliest stages, to commence with an emetic of ipecacuanha or sanguinaria, and to follow this with a purgative dose of calomel, or of calomel and rhubarb conjointly. Afterwards, the patient should be put immediately upon the use of opium and ipecacuanha with calomel, a dose of which, containing half a grain of each of the first two ingredients and one or two grains of the third, should be given every three or four hours; and persevered in until the gums become affected; the mercurial pill being substituted for the calomel, should the latter purge. So soon as decided signs of debility or prostration appear, stimulants should be resorted to, the milder being first employed, and the more energetic afterwards, if these should not answer the purpose. Infusion of serpentaria, small doses of carbonate of ammonia, and wine-whey may be first used; then, if necessary, compound infusion of Peruvian bark or quinia with wine; and, lastly, brandy in the form of milk-punch or beat up with the yolk of eggs and sugar. When the debility is considerable, wine and sulphate of quinia are the standard remedies, and should be used freely, without intermission, until the danger is passed. Ardent spirit must be resorted to in the cases of those in any degree accustomed to it. Oil of turpentine very freely given is also serviceable, and may be considered as especially applicable when there is considerable bloody discharge from the lungs. Musk has been highly recommended in the dose of twenty or thirty grains. Dry cupping and blistering are important adjuvants. If the bowels are confined, they should be kept daily open by means of rhubarb, in the form of aromatic infusion or tincture. The diet should be nutritious, and sometimes even stimulating. In the earlier stages, tapioca, sago, arrow-root, &c., prepared with nutmeg, sugar, and a little wine; in the advanced stages, milk, egg and wine, rich broths and jellies, and even essence of beef, should be employed.

In asthenic cases of pneumonia, known to be such from the commencement, the free employment of sulphate of quinia, given so as to suppress the febrile movement, will probably be found one of the safest and most efficacious methods of treating the disease. It has the advantage, that its depressing effects are produced through an excitation of the cerebral centres so great as to repress their functions, and those of dependent organs, without producing fatal prostration on the one hand, or, in this state of system, a dangerous cerebral congestion on the other.

Chronic Pneumonia.—In this affection, the treatment must be directed by circumstances. If the consolidation of the lung continue, without evidence of suppuration or abscess, it may sometimes be proper to take a little blood from the arm or chest, especially when there is pain or exacerbation of fever. But the remedy should be used with caution. The most efficacious measure is probably a steady course of the mercurial pill, in small doses, so repeated and continued as to produce and sustain the slightest visible impression on the gums for a considerable time. Should mercury fail, iodide of potassium may be tried. Squill and seneka, with or without ipecacuanha, tartar emetic, or sanguinaria, will be found valuable adjuvants. These medicines may in general be most conveniently combined together, in the form of their officinal liquid preparations; and advantage will accrue from adding to them some preparation of opium, especially one of the salts of morphia, or, as a substitute for this, extract of hemp, hyoscyamus, lactucarium, or conium. Blisters should be applied in rapid succession to the chest; or a steady external irritation should be kept up by means of tartar emetic, croton oil, an issue, or a seton. When suppuration has taken place, and hectic symptoms appear, infusion of wild-cherry bark with one of the mineral acids; morphia, or one of the other narcotics, with expectorants, to allay cough; and the inhalation of tar vapour, are the chief remedies. In this condition no mercurial should be given. In infantile cases, especially, I have found the greatest apparent advantage from causing the child to inhale constantly, for weeks or months together, the air of an apartment more or less impregnated with the vapours of tar. This may be effected by exposing tar, in a water-bath, to a moderate heat by means of a nurse lamp. The diet must be regulated by circumstances, being exclusively of vegetable aliment when there is increase of inflammatory symptoms, of this with milk in moderate cases, and, when there is debility, of the more nutritious and digestible forms of animal food.

Article II.

GANGRENE OF THE LUNGS.

THIS occurs sometimes, though rarely, as a consequence of ordinary pneumonia. When this disease is sufficiently extensive and violent to prove fatal, death results before the parenchyma, even if it has lost vitality, has had time to undergo that putrefactive decomposition which characterizes gangrene. Hence, this affection is most frequently connected with cases of circumscribed pneumonia, which sometimes ends in abscesses, and in which, on account of the smaller extent of the disease, life is in less immediate danger than when the inflammation is more extensive. It is probable, too, that gangrene is less frequently dependent on the mere violence of the inflammation, than on a peculiar predisposition, derived from a vitiated state of the blood, or a depraved and debilitated condition of the system.

But, in most cases of gangrene of the lungs, the antecedent or attendant inflammation is so slight as to have led to the suspicion, that it is not the cause, nay, that it is sometimes even the effect of the mortification, and quite analogous in its origin to that which surrounds an eschar resulting from the external use of caustic. This may be true, in some cases, in which the gangrene results from mechanical causes interfering with the circulation in portions of the lung. But the probabilities are, that, as some degree of inflammation is always present, and, where examinations have been made, has usually been found to precede the evidences of gangrene, it is in fact generally the cause of this state. The inflammation, however, is so modified by its cause, or by the condition of system, as to be peculiarly disposed to run into gangrene; and thus modified, it deserves to be considered as a distinct variety, which might very properly be designated as gangrenous inflammation of the lungs, as we speak of gangrenous erysipelas, sore-mouth, &c.

Two varieties of gangrene of the lungs are admitted by Laennec and most subsequent writers, in one of which the disease occupies a large portion of the lung, and is without definite boundary, in the other is of comparatively small extent, and has a precise outline. The former may be called *diffused*, and the latter *circumscribed* gangrene. The diffused is comparatively rare; only six out of sixty-eight cases, collected from various sources by M. Laurence, having belonged to that variety. (*Dict. de Méd.*, xxvi. 48.)

Anatomical Characters.—In the *diffused gangrene*, the greater portion of one lobe or of a whole lung is usually involved; the mortified and healthy portions being insensibly blended, or separated by inflamed parenchyma in the stage of congestion, or more rarely of hepatization. The lung is more moist and less cohesive than in health, has the density of the congestive stage of pneumonia, and presents dirty-whitish, greenish, brownish, and blackish hues, variously intermixed, and sometimes still further diversified by portions of a livid redness. Here and there parts of the lungs are softened and completely disorganized, and when cut exude a greenish-gray and excessively putrid sanies. Among the lesions present are sometimes also diffused infiltration of blood, and small spots of sanguineous extravasation.

The *circumscribed gangrene* generally occupies only a small portion of the lung, but is sometimes very extensive. In either case, it is characterized by having a definite boundary. Three stages are distinguished by Laennec; the first, that of recent mortification, the second, that of deliquescence or breaking down of the tissue, the third, that of a cavity or abscess. These stages present the following characters. In the *first*, the mortified portion is of a black or greenish-black colour, of a firmer and denser consistence, but moister than in health, and of an offensive odour. In the *second*, the slough has either been softened, and converted into a greenish-gray, sometimes bloody, and excessively fetid pasty matter, or much more rarely has been separated from the pulmonary tissue, and lies unconnected. In the *third*, the putrid colluvies has been discharged through the bronchial tubes, and a cavity exists, sometimes traversed by blood-vessels which have escaped destruction, and generally containing a purulent, or blackish, sanious, and extremely offensive matter, secreted by the walls of the cavity, and sometimes blood proceeding from the open mouths of divided vessels. Around the cavity is a portion of inflamed lung, seldom more than an inch in thickness, and in the stage usually of hepatization. A newly organized secreting membrane generally lines the cavity, but sometimes no such membrane exists, and the walls consist of the inflamed pulmonary tissue. They are in some instances firm, dense, and dry, in others soft and fungous.

Instead of opening into the bronchia, the cavity sometimes forms a communication with the pleura, into which its contents are discharged. In other instances, it communicates with the bronchia and pleura at the same time. In both cases, pleurisy and pneumothorax are produced; the air in the former being derived from the decomposition of the disorganized tissue of the lung. Occasionally the layers of the pleura are consolidated by adhesion, and the matter makes its way into the areolar structure beneath the skin. A case is recorded in which a large portion of mortified lung escaped through an abscess formed in the walls of the chest beneath the mamma, and the patient ultimately recovered. (*Lond. Med. Times and Gaz.*, iv. 578.)

Besides the form of gangrene above described, this condition is sometimes found in the walls of abscesses, or of tuberculous cavities.

Symptoms.—In the diffused gangrene, great prostration takes place at the commencement, with much oppression, a small, frequent, and feeble pulse, and a copious fetid greenish or dark bloody expectoration. But the patient soon loses the power of throwing off the matter, which accumulates in the lungs, and produces suffocation. In the circumscribed variety, a great diversity of symptoms precedes those which indicate the existence of gangrene. Usually there are some signs of inflammation; but a degree of prostration and anxiety is exhibited, altogether disproportionate to the extent of local disease, as indicated by the symptoms, or by physical exploration. The patient expectorates a rather opaque mucus, and sometimes blood. But nothing characteristic of the affection is perceived, until the matter coughed up begins to have a putrid smell. The cavity has now opened into the bronchia; and, if the ear be applied, a gurgling sound, or cavernous respiration and pectoriloquy will be heard, according as the cavity contains liquid or is empty. These physical signs, connected with the excessive fetor of the breath, and the character of the expectoration which now takes place, are sufficiently distinctive of the affection. The matter discharged is purulent or sanious, of a greenish, yellowish-brown, or ash-gray colour, and intolerably fetid. According to Dr. Stokes, the breath may not be offensive, while the sputa are very much so; and Rilliet and Barthez state that, out of sixteen cases in children, five only were accompanied with a gangrenous odour of the breath, and three others with a simply fetid odour. Blood is frequently expectorated, and sometimes disorganized portions of the lung. Pain of the most violent character occasionally attends the progress of the complaint. The patient often sinks rapidly, and dies in the second or beginning of the third stage. Sometimes he is cut off suddenly by hæmoptysis. But occasionally the first shock is survived, and the disease runs on for weeks or months. In this case, the expectoration becomes quite purulent, though still extremely offensive, and hectic fever sets in, with night-sweats, great debility and emaciation, and all the obvious symptoms of pulmonary consumption, under which the patient at length sinks exhausted. The termination, however, is not always unfavourable. After a severe struggle, the system sometimes rallies, the matter discharged gradually diminishes, becomes mucous instead of purulent, and ceases to be offensive; the hectic symptoms disappear, and the patient is restored to health. From the researches of Laurence, it appears that, out of sixty-eight cases recorded by various authors, eight ended favourably. Valleix, however, upon analyzing the reported cases of cure, found them very defective in precise details.

The offensive odour and purulent expectoration are not alone sufficient evidences of gangrene, without the signs of a cavity. Cases have occurred presenting the two former symptoms, which, after death, have exhibited no appearance of mortification; though Laennec observes that, in two instances of the kind which he had seen, there was an unusually strong tendency to putrefaction in the body generally. It is very possible also, as already stated,

that gangrene in the lungs may exist without evincing itself by fetor of the breath. An example of this we have in cases which terminate in death, before the gangrenous abscess has communicated with the bronchia. But we have no means of certainly ascertaining the existence of this condition during life. It may be suspected when great prostration comes on, along with evidences of a moderate extent of pulmonary inflammation, and without any general typhoid tendency. Gangrene, supervening upon tuberculous vomicæ, may be known by the antecedent symptoms. Should the signs of a cavity have been presented before the gangrenous odour of the breath, and without the marks of pneumothorax, it may be taken for granted that either an inflammatory or tuberculous abscess preceded the occurrence of gangrene. Rilliet and Barthez look upon expectoration of blood as one of the most conclusive signs of gangrene in children, having observed this phenomenon in six out of sixteen cases; a very large proportion, when the rarity of pulmonary hemorrhage in children is considered.

Causes.—These have not been well ascertained. The diffused variety is said sometimes to be produced by exposure to deleterious vapours, as when persons die from descending into old privies. Whatever greatly debilitates the system and depraves the blood, may act as a predisposing cause. Hence, the affection is apt to occur in the intemperate, and those exhausted by depressing diseases. Dr. Fischel, of Prague, found it peculiarly prevalent among the insane, having noticed it in more than seven per cent. of his autopsies among that class of patients. (*Med. Exam.*, N. S., vi. 334) There is no doubt that it occasionally depends upon the obstruction of one of the branches of the pulmonary artery by a fibrinous clot, either formed in the vessel, or carried thither from the heart. It is said sometimes to have followed pulmonary apoplexy. According to Dr. Stokes it may be induced by tumours pressing on the nutrient vessels and nerves of the lung. It attacks preferably persons in middle life. The very young and very old are rarely affected.

Treatment.—This must be directed chiefly to the support of the general strength, until the diseased lung shall have gone through the requisite process for throwing off the slough, and repairing the consequent loss of substance. At the same time, it is important to counteract the morbid tendency of system by improving the quality of the blood. Both of these indications are met by the use of tonics and stimulants, and a generous diet. It is obvious that the degree of stimulation must be proportioned to the apparent exigencies of the case. It is not altogether incompatible with this plan, that a little blood should be taken by cups from the neighbourhood of the affected part, when the pain and other evidences of inflammation are considerable. A depraved blood may be quite capable of supporting the inflammatory process, even more so than the same fluid properly constituted. We may, therefore, very properly attempt to produce good blood by nutritious food, and a degree of stimulus necessary at once to a proper assimilation of that food, and the support of the nervous power, while we abstract a certain quantity of the diseased fluid. But experience has shown that depletion must be used very cautiously in such cases. Carbonate of ammonia, wine, and even ardent spirit may be necessary when the debility is great; and these should be conjoined with opium or camphor, or both. Bark or quinia is also an excellent adjuvant, in order to give a more permanent support. When the case runs on to suppuration and hectic, the mineral acids, and especially the nitromuriatic, are appropriate remedies. In this stage, sulphate of quinia, or infusion of wild-cherry bark should also be given freely; and malt liquors are perhaps preferable to the more concentrated forms of alcohol. Chloride of soda, or creasote, may be used internally; and chlorine gas, as it issues from moistened chloride of lime, may be inhaled with the air of the apartment. The gas is useful also

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takes place, which, becoming concrete immediately after elimination, adheres in the form of false membrane to the surface of the pleura, and is attended with no liquid, or with a quantity too small to be appreciated. But more frequently the two forms of extravasation are associated, if not at the beginning of the disease, yet very soon afterwards.

At first the coating of concrete matter is very thin and soft, and over a great portion of the lung is scarcely visible, being rendered sensible only by scraping it from the surface. It afterwards becomes thicker, and has a grayish, grayish-white, or slightly reddish hue; but is still soft, paste-like and easily detached. I have, however, seen it almost black, probably in consequence of the simultaneous deposition of melanotic matter. Somewhat later, it has acquired a firmer consistence, and become more adherent. Its surface is usually somewhat rough, from the inequality of deposition, as well as from the friction of the opposite portions of membrane, though in some instances it is nearly smooth. Its extent corresponds with that of the inflammation, and it sometimes covers the whole of one pleura, though not always equably. It is of a fibrinous nature, and is susceptible of organization, exhibiting first red points, then red lines ramifying here and there, and at length forming a close vascular connection with the pleura. At first there is little liquid with this concrete substance; but the quantity gradually increases, and sometimes becomes very great, varying from a few ounces to several pints. Occasionally it is traversed by filaments or bands of the plastic matter, running between the costal pleura and that of the lung. When copious, it fills up the cavity of the pleura, and, in some rare cases, has been known, in the course of a few days, largely to distend the chest, and by its pressure to displace very considerably the neighbouring viscera, whether of the thorax or abdomen. But it is more frequently in the protracted or chronic cases, that these results take place; and they will be particularly noticed hereafter. In acute pleurisy, the distension is not often very striking. In relation to the character of the liquid, it is usually a yellowish, limpid, or slightly clouded serum, with flocculi of concrete matter floating in it. Often, however, it is more turbid, like whey; sometimes is seropurulent or purely pus, and occasionally bloody, with or without coagula. In ordinary cases, it has little or no odour. It is usually free in the cavity, changing its position with the movements of the patient; but it is sometimes limited and confined by old or recent adhesions of the pleura.

The lung is compressed by the fluid, and forced from its ordinary position, generally towards the mediastinum or spinal fossa. The degree to which it is compressed and displaced depends upon the quantity of the liquid; and, when this is very great, it is sometimes reduced to a sort of flattened cake, scarcely larger than the hand, which is confined to the upper and back part of the chest. This, however, is more common in chronic than acute pleurisy. The air-cells, though compressed, do not in recent cases contract adhesions, and may be readily expanded by the insufflation of the lungs.

During these changes, the proper serous membrane is not thickened or materially softened; and, if it sometimes appears swollen, this is owing to the injection or infiltration of the areolar tissue beneath it, or to the superposition of false membrane. It may sometimes be peeled off from the lung or chest more easily than in health. It almost always happens that, when a portion of the pleura is coated with concrete exudation, that opposite to and in contact with it is similarly affected. Sometimes a small portion of the surface of the lung is gangrenous, in which case, the fluid of the cavity, as well as the false membrane, has an extremely offensive odour. Occasionally the pleurisy has been caused by the opening of a tuberculous or gangrenous cavity of the lung, communicating with the bronchia, into the pleural cavity, which thus contains air along with purulent fluid. (See *Pneumothorax.*)

In cases which terminate favourably, the effused liquid is gradually absorbed, and, if no false membrane has been formed, the parts are restored without change to their original condition. But this is probably a comparatively rare result. More commonly, the opposite surfaces unite, in consequence of the adhesion and organization of the coagulable lymph with which they were coated. When no liquid exists in the cavity to prevent the contact of these surfaces, the union often takes place in a very short time. But when liquid is present, it must be removed by absorption before such a union can be effected, and more time is of course necessary for the cure. The whole of the inflamed surfaces do not unite at the same time; but those parts first which first come in contact, and afterwards other parts successively, as the fluid undergoes absorption. Occasionally, portions of the fluid are retained here and there in the meshes of the false membrane. The changes do not end with the mere junction of the pleural surfaces. The organized lymph undergoes a vital process by which its superfluous parts are removed, and at length the connecting medium is reduced to a delicate tissue of cellular membrane. Sometimes the whole cavity of the pleura is thus abolished; in which case, the patient cannot be again attacked with pleurisy of the same side. In other instances, the adhesion is only partial; and sometimes filaments of cellular membrane run from the pleura of the ribs to that of the lungs, having been formed, probably, during the plastic state of the exuded lymph, by the movement of the lung upon the wall of the chest during respiration, drawing it out into slender connecting bands. With the absorption of the liquid, the lung again expands; but, if the compression has continued long, the air-cells do not at first yield completely to the expanding force, and the lung consequently does not immediately recover its original dimensions. The walls of the chest are, under these circumstances, forced inward, and the contents of the abdomen upward, to supply the deficiency. But this rarely happens to any considerable extent in acute pleurisy; and, even when the chest is at first somewhat contracted, it in time usually resumes its former shape, in consequence of the recovered expansibility of the lung. In chronic pleurisy, the case is sometimes much otherwise. Occasionally, the lesions resulting from inflammation are confined to the interlobar and diaphragmatic pleura.

Chronic Pleurisy.—As this form of pleurisy is in general nothing more than a continuation of the acute, the same anatomical appearances are presented, though somewhat modified by the influence of time. The false membranes are usually thicker, and often exhibit several layers of different consistence, those first deposited being firmest and adherent to the pleura, and the recent, softer and nearer the surface. The liquid, though sometimes limpid, is less frequently so than in the acute disease. It is generally turbid with abundance of fibrinous flocculi, or quite purulent, and not unfrequently has a disagreeable odour. Sometimes it is of a consistence like that of thin jelly. The quantity of the fluid is usually much greater than in the acute form. It is sometimes enormous, producing great dilatation of the thorax, and compressing the lung into a very small space along the spine and mediastinum in the upper portion of the chest. In consequence of the length of time during which it is thus compressed, the lung changes its texture, ceases to be crepitant, and assumes an appearance somewhat similar to that of the same organ in the fœtus. It is scarcely penetrated by air or blood; and is sometimes bound down in its confined position by organized false membrane, so that it could not expand, even were its cells not obliterated. The mediastinum, heart, and upper abdominal viscera are displaced much more than in acute pleurisy. In some instances, instead of this great distension, the lung is here and there adherent to the wall of the chest, forming one or more sacs in which fluid is contained; and bands of false membrane frequently pass from one part of the pleura to another.

When the effusion is not purulent, and the disease is not complicated, absorption of the liquid, under proper treatment, generally takes place in the end, and the case advances towards a cure. But, as the lung cannot now readily expand by the admission of air, the walls of the chest, the mediastinum, and the diaphragm are forced by the atmospheric pressure into the space before occupied by the liquid. A portion of the space is also filled up with false membrane, which is sometimes very thick, so much so that it cannot be converted wholly into areolar tissue, as in acute pleurisy, and therefore assumes a fibrous consistence, and occasionally becomes the seat of various morbid processes, resulting in the production of cartilaginous or bony plates, tubercles, abscesses, hemorrhagic effusions, and even gangrene. In certain rare cases, the ribs themselves undergo a peculiar change, their internal surface being replaced by a new bony formation, which gives them a prismatic or triangular form. (Parise, *Arch. Gén.*, 4e sér., xxi. 320 and 478.) Sometimes the walls of the chest are forced inward contrary to their elasticity, so that, when a puncture is made from without, the air rushes in to supply the vacuity produced by their resilience.

In some instances, effusion goes on as rapidly as absorption, and the liquid accumulation remains for a great length of time. This is especially the case in *empyema*, or collections of pus in the cavity of the pleura. Sometimes the pus makes its way into the substance of the lung, and a fistulous communication is formed between the bronchia and the pleural cavity, through which pus is discharged and air admitted. In other instances, the liquid takes an external direction, and by means of ulceration escapes into the areolar tissue without the chest, and, travelling occasionally for considerable distances, produces subcutaneous abscesses in various parts of the chest, which ultimately open, unless life is previously worn out. In thus travelling, the pus has been known to occasion caries of the ribs and vertebræ. Sometimes the purulent collection is found to be connected with a tuberculous vomica.

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Symptoms, Course, &c.

Acute Pleurisy.—This disease commences usually with a febrile chill, and sharp pain in the side; and the characteristic symptoms subsequently are pain in the side, cough, short and quick breathing, and fever. Each of these requires a more particular notice.

The *pain* may come on before the chill, or along with it, or a short time after it. In character, it is severe and sharp, as if from the thrust of a sharp instrument, and hence it is frequently designated by the term *stitch* in the side. It is usually confined to one spot, most commonly somewhere in the mammary region; though it is occasionally felt elsewhere, as, for example, near the lower margin of the chest, when the pleura of the diaphragm is inflamed. The reason of this concentration of the pain is probably that, when nervous trunks are inflamed, the suffering is referred to the part in which the nerves are distributed rather than to the real seat of disease; and, as the nerves coming off from the spinal marrow are distributed over the anterior part of the chest, the inflammation affecting them in their course makes itself felt in the latter position. Sometimes, however, it is diffused over the side, and is then less severe. It is increased by inspiration, cough, pressure in the intercostal spaces, and generally by lying upon the affected side, probably in consequence of the weight of the lung bearing upon the inflamed membrane. It may often be suspended by holding the breath. Sometimes it is observed to increase and diminish with the exacerbations and remissions of the fever. Occasionally it is attended with a burning sensation. It generally moderates considerably in one, two, or three days, as the effusion increases; and the difficulty of lying on the affected side now greatly diminishes or ceases. In some cases it is scarcely felt from the beginning, unless with full inspiration or coughing, and, in others, is quite wanting, or felt only as soreness when pressure is made between the ribs.

The *cough* is at first short and dry, or attended with a slight mucous or frothy expectoration, and may remain so throughout the complaint. Frequently, however, in consequence of the existence of some bronchial inflammation, the discharge is more copious; and occasionally it is streaked with blood. In some cases, it is exceedingly painful; and the patient often endeavours to restrain it, though not always successfully. It is, however, much influenced by these efforts, sounding as if interrupted and unfinished, in consequence of the partial contraction of the muscles concerned in it. Cases now and then occur in which it is wholly wanting; and, as pain is also sometimes wanting at the same time, the disease has, under these circumstances, been designated by some writers as *latent pleurisy.*

The *breathing* is almost always more or less difficult or embarrassed. In consequence of the pain produced by a full expansion of the lungs, the inspiration stops short before it is completed. The patient is said to have a catch in his breath. As less air is thus taken in at one inspiration, the deficiency must be supplied by a more frequent repetition; and hence the breathing is not only short but rapid, though the patient is often scarcely aware of the change. The dyspnœa, instead of diminishing with the pain, often increases as the disease advances; but it now arises from the compression of the lung by the effused fluid. The function of one lung is always cramped, sometimes entirely suspended; and the other lung is scarcely adequate to the increased duty. The patient, therefore, feels a want of breath, which is sometimes distressing. This

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The respiratory murmur, somewhat enfeebled by the defective movement of the lung from pain, is still more so when liquid effusion takes place, and goes on diminishing with the increase of effusion, and of the consequent compression of the lung, until it entirely ceases in those cases in which the liquid is abundant. Where the lung is still in contact with the chest, the healthy murmur is often superseded by bronchial respiration, dependent upon the compression of the air-cells, which thus more readily convey the vibrations of the bronchia to the surface. This sound is usually greatest near the root of the lung, and diminishes as we recede from that part, though it often extends more or less over the whole side of the chest. According to Béhier, cavernous and amphoric respiration, and amphoric resonance of the voice are sometimes heard under similar circumstances. (*Arch. Gén.*, Août, 1854, p. 129.) But, when the effusion is very abundant, these sounds are also quite lost, except in the region between the scapulæ, and sometimes even there. On the opposite side of the chest, the respiration is louder than is usual in health, and often becomes puerile.*

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* There is little difficulty in explaining the abnormal sounds of respiration upon the side affected; but how account for the puerile respiration or exaggerated respiratory murmur of the sound side? The explanation generally given is that, in order to supply the deficiency in the diseased lung, respiration is carried on more vigorously in the sound; the quantity of air entering the lungs being greater, and its movement through the air-passages more rapid. But this explanation is not considered by M. Woillez as satisfactory in cases in which the muscular effort of inspiration is not increased; for there is no inherent power in the lung itself to modify the movement of the air within it. By this writer it is thought that the phenomenon may be better explained by the diminution in the normal dilatation (béance) of the air-passages, consequent upon the pressure of the effused fluid forcing the mediastinum towards the sound lung, and thus diminishing its capacity. From this reduction in the air-space of the lung, extended, of course, throughout all the bronchia and air-cells, the walls of these air-passages are relaxed, and their inner surface less tense and smooth. The friction of the air in its passage is consequently greater, and the sound resulting from this friction louder. This view is confirmed by the existence of the same exaggerated respiratory sounds in children, in whom this normal dilatation is less than in adults, as proved by the less amount of collapse of their lungs when removed from the chest. The same principle is applied by M. Woillez to the explanation of the abnormal sounds in the diseased side. The *feeble respiration* depends on the less amount of air which reaches the ultimate cells, in consequence of the diminution in the normal expansion (béance) of the passages; the *sibilant and sonorous* rales, sometimes heard, on the same narrowness of the passages; the *bronchial respiration*, on the complete abolition of the cavity of the ultimate ramifications of the tubes and of the cells, so that the air not reaching these parts, is reflected by the larger tubes, and thus gives the bronchial character to the resonance; the *amphoric respiration* occasionally heard, on the complete suppression of the *béance*, except in a few larger bronchia, from which the reflected resonance is like that produced by the air entering large cavities. (*Arch. Gén.*, Août, 1865, pp. 164–167.) For the views of M. Woillez upon the normal *béance* of the lungs, the reader is referred to the note on *page* 894 of the first volume. (*Note to the sixth edition.*)

The vocal resonance, increased at first while the exudation is plastic,
comes at a somewhat more advanced stage of the disease quite pecul
When a moderate effusion has taken place, and a thin stratum of liquid in
venes between the lung and side of the chest, the tremulous, quivering,
bleating sound of the voice denominated ægophony is heard. The bronc
sound, conveyed outward by the compressed parenchyma, was supposed by
ennec to be modified as it passed through the liquid, and to acquire the st
ing character alluded to before it reaches the ear. The peculiar sound is he
especially between the third and sixth ribs, in the interscapular region, and
tween the scapula and the mamma. It is most obvious in women and childr
in consequence of the higher tone of their voice. Over the larger bronc
near the spine, for example, it is often mingled with the bronchial resona
and the sound acquires a peculiar complex character. As the effusion
creases, ægophony diminishes, and at length ceases. Dr. Williams is of o
ion that little sound of the voice is transmitted, when the stratum of interv
ing liquid exceeds an inch, except over the larger tubes. When the qu
tity of liquid is very great, no vocal resonance is heard, unless in a narr
space upon the side of the spine. These results are of course modified, wh
the lung adheres more or less extensively to the sides of the chest. In s
cases, the bronchial resonance is usually loud and distinct at the adher
parts, in consequence of the compression of the air-cells. When the ext
of adhesion is small, the compressed lung forms a column, or kind of inter
stethoscope, for conveying the sound to the ear. The vibration of the w
of the chest is affected similarly with the sound of the voice, being somew
increased while the effusion is plastic, gradually diminished with the incre
of liquid, and suppressed when the intervening effusion is copious, but
distinctly observable where the lung adheres. Hence, when one hand is pla
upon the sound side, and the other upon the diseased one, and the patien
told to speak, little or no movement is felt in the latter, with the except
just mentioned; while in the former the thrill is distinct.*

Besides the above signs, there are others derived from the movements
shape of the chest, and the relative position of neighbouring organs. Th
the affected side may sometimes be observed to be quiescent, while the ot
moves in respiration. When the effusion is great, the chest may be visi
distended, and, if measured by a tape, in the direction of a line around
body at the scrobiculus cordis, will be found to be larger on the diseased th
the sound side. This, however, is not common, to any great extent, in ac
pleurisy. Any difference that may exist will be most readily detected
making the measurement at the moment of full expiration, as it is then greate
in consequence of the non-contraction of the distended side. But the f
must always be taken into account, that the right side in health ordina
measures from a quarter to half an inch more than the left. The displa
ment of the heart, liver, &c. is much more frequently to be observed in
chronic than the acute form of the disease.

The *course* of acute pleurisy is variable and uncertain. There is reason
believe that, if vigorously treated by depletion at the beginning, it may of
be arrested almost at the threshold, before it has exhibited any other sympto
than pain, decubitus on the sound side, a little cough, and a chill followed

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* From recent observations it seems to have been proved, that the ascription of
sound of ægophony by Laennec to modifications produced by passing through the strat
of liquid was incorrect; for the sound is heard in these cases even after the removal
all the liquid, if the presence of false membrane prevent the lung from expanding.
sound thus appears to depend not directly on the liquid, but on the state of the lung
duced by its presence in the cavity. It is even louder, and seemingly nearer the ear w
observed through a layer of false membrane after the liquid has been withdrawn by
ping. (Landouzy, *Arch. Gén.*, Déc. 1861, p. 669.)—*Note to the sixth edition.*

fever. Exudation not having yet taken place, the physical signs are wanting. Should a catarrhal cough have preceded the attack, or should no cough exist, as sometimes happens, there are no means by which the disease could be certainly distinguished from febrile pleurodynia, which has the general symptoms above mentioned, and the same diminution of the respiratory murmur, arising from the restrained movements of the chest. Hence the doubt, in these cases, whether it was pleurisy or rheumatism of the intercostals that was cured.

In other cases, along with the general symptoms mentioned, there is the friction sound upon auscultation, which is sufficiently decisive as to the nature of the complaint. The exudation of coagulable lymph has probably taken place, and a longer period is necessary for the cure. Sometimes, however, the morbid phenomena wholly disappear in from three to five days, leaving no unhealthy sound in the chest. In such cases, the opposite surfaces of the pleura have united, and the friction sound ceases of course.

In a third set of cases, the signs of liquid effusion are perceived sometimes on the first day, sometimes not until the second, third, or even fourth day, when the severe pain abates. In these cases, the friction sound, if observed at all, is soon followed by feebleness and gradual cessation of the respiratory murmur, by bronchial respiration, ægophony, and dulness on percussion. Should the progress of the disease be now arrested, the general symptoms abate, and the morbid sounds gradually give way to the healthy, as the fluid is absorbed. The friction sound is sometimes heard for a brief period after absorption has taken place, and before union between the opposite surfaces has been effected. The disease is usually cured in five or seven days.

But, instead of the favourable turn at the period above alluded to, there is often a continued advance of the disease; the effusion goes on increasing; ægophony ceases; the bronchial respiration becomes more and more distant, until this also ceases, or is but faintly heard; flatness upon percussion prevails to a greater or less extent over the affected side of the chest, generally varying with the position of the patient; the dimensions of the side are sometimes even visibly enlarged; and the healthy vibratory movement of its walls in speaking is much lessened or quite wanting, as may be ascertained by applying the hand to the surface. The pain has nearly ceased, and the fever moderated; but the dyspnœa is often great, and the patient is unable to lie upon the sound side. The disease, in this form, continues for a very variable period. Sometimes recovery takes place in two or three weeks, sometimes not for months; and the complaint not unfrequently assumes the chronic form. Should it terminate favourably, the fever, cough, and dyspnœa gradually disappear, the dulness on percussion diminishes, ægophony occasionally returns in the progress of the absorption, the respiratory murmur is again heard, the friction sound may be noticed for two or three days or more, and health is at length re-established. The clearness on percussion, and the healthy respiratory sound, return usually first in the upper part of the chest, and afterwards in the lower. As the lung has not been sufficiently long compressed to have lost its expansibility, it is generally dilated as the fluid is absorbed; but sometimes, either from its own altered state, or because bound down by false membrane, it does not completely resume its original dimensions, and a degree of contraction in the diseased side of the chest ensues, which, however, generally diminishes, or disappears with time. The favourable termination is often attended or preceded by certain critical affections, as urinary sediment, copious perspiration, diarrhœa, eruptive affections of the lips and skin, phlegmonous tumours, and rheumatic pains. After convalescence, the patient not unfrequently complains of a stitch in the side upon taking a long breath; and sometimes a degree of cough, dyspnœa, and frequency of pulse remains for a considerable time.

I have known the friction sound, after being first noticed at the commencement of the disease, to continue uninterruptedly for a long time, gradually becoming coarser with the continuance of the disease. In one case of chronic pleurisy, it continued for several weeks. This may be ascribed to the exudation of a fibrinous matter imperfectly coagulable, with too little adhesiveness to serve as a bond of union between the opposite pleural surfaces, and insufficient vital force to undergo organization.

Other diversities in the disease require notice. When the inflammation occupies both pleuræ, the pain may be felt in both sides, or one only, or may be absent; the dyspnœa is much greater than in the ordinary variety; and the fever and other attendant symptoms are more severe. There is no longer the advantage of a comparison of the two sides in auscultation or percussion. Nevertheless, the signs are generally sufficiently evident. *Double pleurisy* is much more dangerous than that which is confined to one pleura.

The inflammation in pleurisy is often partial; being limited by previous adhesions, or prevented from spreading over the whole membrane by some unknown cause. Thus, it may occupy only the *costal and the opposite pulmonary pleura*, in which case the symptoms are all those above enumerated. It seldom if ever happens that one of these surfaces is inflamed, for any length of time, without involving the opposite surface, when in contact with it. The *pleura of the diaphragm* is sometimes the exclusive seat of the disease. In such cases, the pain is usually along the lower border of the chest, or in the hypochondriac region, and is much increased by vomiting, eructation, inspiration, and sometimes by pressure on the abdomen. M. Gueneau de Mussy has pointed out, as extremely sensitive to pressure, a spot situated one or two fingers' breadth from the linea alba, on the level of the bony part of the tenth rib. Not only is extreme pain felt when this point is slightly pressed, but there is at the same time experienced a sudden increase of the dyspnœa, so great as apparently to threaten suffocation. (*Arch. Gén.*, Sept. 1853, p. 274.) The patient breathes with the ribs rather than the diaphragm. The difficulty of respiration is sometimes so great as to render the erect posture necessary. Occasionally the pleurisy is associated, in these cases, with nausea and vomiting, and symptoms of jaundice, probably in consequence of the extension of irritation from the pleura to the subjacent organs. In fatal cases, delirium often precedes death for some days. Again, the inflammation may be seated in the mediastinum, or in the fissures between the lobes of the lungs; but there is scarcely a sign by which it could be certainly distinguished in these situations. The position of the pain, and the absence of the peculiar signs of other diseases, might lead to probable inferences. Occasionally, abscesses have been found in these situations after death; and sudden discharges of pus by expectoration sometimes occur, which may be conjecturally ascribed to the opening of such abscesses into the bronchia.*

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* Prof. Guntner, who has seen three cases ending in the formation of abscess in the anterior mediastinum, gives the following symptoms of the affection. The first evidence is from pressure on the organs lying behind the mediastinum. Hence a feeling of oppression, dyspnœa, dull pain, weight behind the sternum, cough, irritation of the larynx with nausea, palpitation, and purple colour of the face. With these is fever of variable degree and duration. But the most characteristic symptom is a tumefaction, which often begins abruptly, is of large extent, with little pain, and unlike an ordinary phlegmonous swelling. With the commencement of this tumefaction, the sensations referred to abate; the swelling now becomes circumscribed, flattens, and presents the appearance of a suppurating phlegmon about to open. The fever persists, and generally, at this stage, assumes an intermittent character. When the abscess opens externally it is generally on the left of the sternum, at the level of the second rib. The cases appeared to have originated in exposure to cold: there was no previous disease; and no disease of the bone. The affection is hazardous, as the abscess may open into the cavity of the pleura, may cause pericarditis, or give rise to purulent infection. The abscess should be opened early. (Oesterreich. Zeitschrift für prakt. Heilkunde, 1859, no. 10–12.)—*Note to the sixth edition.*

Pleurisy sometimes occurs, and runs its whole course, without pain, cough, or observable dyspnœa, and without having attracted attention during life. These *latent* attacks usually take place in the progress, or at the close of other diseases, or in individuals previously much weakened, or cachectic.

When acute pleurisy is about to terminate fatally, which very seldom happens in the uncomplicated disease, if well treated, the effusion increases, the breathing becomes very greatly oppressed, the countenance assumes a pale hue and anxious expression, the pulse increases in frequency and at length becomes small and feeble, and the heart ceases to beat in consequence of the imperfect performance of the respiratory function. In the advanced stages, death sometimes results from a gradual failure of the powers of the system, under the combined exhaustion from the discharge, and irritation from the diseased structure. In double pleurisy, according to Andral, a fatal issue may take place from the mere influence of the inflamed membrane, without any discoverable amount of fluid effusion. (*Clinique Méd.*, iv. 518.)

Chronic Pleurisy.—This is, in most instances, a mere continuation of the acute, though sometimes apparently of the same lower grade of action from the beginning. When pleurisy is connected with other complaints of a chronic character, such, for example, as phthisis, it is apt to assume itself the chronic form; and, in very obstinate cases of the disease, which long resist the plans of treatment ordinarily most effective, there is ground for suspicion, that the obstinacy may be owing to some other existing, though possibly concealed organic affection.

In this form of pleurisy there are occasionally sensations of acute pain, but more frequently of mere soreness, oppression, weight, or vague uneasiness. There is also in general more or less cough, which is sometimes short and dry, but sometimes also attended with even copious expectoration, which may be either mucous or purulent. In the latter case, the disease is usually complicated with chronic bronchitis. In some instances cough is wanting. The most prominent general symptom is dyspnœa, which is in some cases very distressing, in others scarcely observable unless in consequence of bodily exertion. It is usually less troublesome in chronic than in acute pleurisy from an equal amount of effusion, because in the former the accumulation is more gradual, and the respiratory organs adapt themselves in some measure to the new circumstances. The patient is often able to walk about, though in general pale, feeble, and more or less emaciated. Sometimes the face appears slightly bloated, and the extremities somewhat edematous; and the œdema is said to be apt to appear on the chest and arm of the side affected. The circulation is in some instances little disturbed; but generally there is frequency of pulse, sometimes great frequency, with paroxysms of hectic fever, night sweats, and great emaciation. In such cases, there is reason to suspect the existence of pus in the pleural cavity, constituting *empyema.*

The physical signs are usually conspicuous. The chest is considerably and sometimes enormously distended, bulging outwards usually in the lower portion upon the side affected, which measures more than the other side. The intercostal spaces are widened, and, instead of being somewhat concave, as in the healthy state, are either flat or convex. Sometimes fluctuation can be felt between the ribs, by placing the flat of the hand upon the side, and striking quickly but gently with the finger one of the intercostal spaces. The ribs do not move in respiration. The heart is sometimes displaced by the pressure. If the effusion is on the right side, it may be found to pulsate on the left of the left nipple, or even in the axilla; if on the left, it may beat under or beyond the right side of the sternum, or in the epigastrium. The mediastinum is also displaced, and affords a dull, instead of the clear healthy sound, to percussion upon the sternum. The liver is sometimes depressed several inches below the margin of the false ribs, and the affection has in consequence been mistaken for chronic hepatitis. The spleen and neighbouring colon are also below their ordinary level in the abdomen. The quantity of purulent liquid sometimes collected in the pleural cavity is astonishing. Mr. T. H. Babbington, of Londonderry, found in one case after death eighteen imperial pints in the right pleura. (*Dub. Hosp. Gaz.*, Jan. 15, 1859, p. 20.)

Percussion yields a perfectly flat sound over the distended part of the chest, and sometimes over the whole side affected, though this is comparatively rare. Very frequently the limits of the flatness vary with the position of the patient, always, indeed, if liquid is present in any considerable quantity, and not confined by adhesions, or by fulness and distension of the whole pleural cavity. The respiratory murmur is wanting, there is no vocal resonance, and even bronchial respiration is but faintly if at all heard, in the distended portion of the chest.

But the above signs are sometimes modified by adhesions. In some places, the lung may adhere to the costal surface, in others may be separated from it by effused liquid. In such cases, bronchial respiration and bronchophony may be heard distinctly in certain parts, and not in others. Sometimes the adhesions are in the lower portion of the chest, which may yield a clear sound on percussion, with the sounds also of respiration and the voice, while the upper parts present the ordinary signs of effusion. Again, the relative positions of the adhesion and the effusion, and consequently of their characteristic signs, may be reversed. Occasionally the diaphragm or mediastinum may adhere to the lung, so that displacement of these parts may not be produced, or at least to the same extent as when no such adhesions exist.*

In the progress of chronic pleurisy, either absorption after a time predominates over effusion, and the liquid is partially or wholly removed; or the pleural cavity remains distended until the patient is worn out, or until the fluid is discharged by a natural or artificial outlet, independently of absorption. In the former case, as the liquid is removed, and the sides of the chest and the lung are brought together, adhesion takes place, accompanied with contraction of the chest, resulting from the want of expansibility in the long compressed lung, or its restraint by false membrane, and its consequent inability to fill up the vacuity. The shrinking of the chest is not at first general. The upper part of the pleural cavity, being for the most part first freed from the liquid, the contraction will be first observed in the corresponding part of the chest, and it will gradually extend downward with the progress of absorption. The contraction may be slight, so as to occasion no obvious deformity, and not materially to interfere with the restored health. Sometimes, however, it is very great; so that the chest, after the completion of the process, scarcely exceeds one-half of its former capacity. The contraction of the false membranes, in the progress of their organization, may contribute to increase the effect, after all the liquid has been removed. The deformity in these cases is considerable. The shoulder is drawn down, the scapula is relatively more prominent and nearer the spine, the ribs are lower and lie more closely together, the liver encroaches upon the chest, and, if the right side be the one affected, the heart may sometimes be heard on the right of the sternum; reversing exactly the derangement previously occasioned by the effusion. More or less disorder of the general health attends this condition of the chest. The patient is affected with shortness of breath and palpitations, especially upon exertion, and continues liable to them for a long time, if not during life. But, if young, he may in a considerable degree surmount these disadvantages, in consequence of the gradual expansion of the lung, and the conversion of the pseudomembranous products into distensible areolar tissue. During the continuance of the contraction, the sounds of respiration and of percussion are usually somewhat imperfect, even though the liquid may have been wholly removed. When the effusion has been partial, and limited by firm adhesions, the chest cannot contract sufficiently to fill the emptied space, which is therefore occupied by air, by the neighbouring viscera thrust into it, or by the semi-solid residue of the absorbed fluid. (*Williams.*)

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* Dr. B. W. Richardson has called attention to a peculiar sound, occurring in the cardiac region, synchronous with the first sound of the heart, which it obscures, while the second is unaffected, and ascribed by Dr. Richardson to the presence of a portion of emphysematous lung, bound down over the heart by pleuritic adhesion. It is described as superficial, differing from the friction sound, from all known murmurs, and from crepitation, and as being "a crackling, coarse sound, resembling somewhat the burning of dried gorse, or the tearing of calico." After expiration, if the patient resisted inspiration, it was absent; after full inspiration, if the breath was held, it was produced by every systole. The cause of it was the impulse of the heart against the distended and confined portion of the lung. (*Med. T. & Gaz.*, Feb. 1860, p. 187.)

In the instances in which absorption is not effected, the fluid may be of a serous character, or may be pus. In the latter case, the danger of a fatal result is the greatest. Large collections of pus in the pleural cavity are seldom if ever absorbed. The symptoms do not always enable us to discriminate between these two conditions. When, however, the affection is very obstinate, and attended with hectic symptoms, the existence of proper *empyema* may be suspected. Nature often attempts, and occasionally accomplishes a cure of this affection. A communication is formed between the pleural cavity and the bronchia, and the pus escapes by expectoration. If not so abundant as to overwhelm the lungs, and produce suffocation, it may thus be discharged, and the patient may possibly reach health through a long and doubtful struggle. Sometimes, moreover, the pus makes its way externally, forming a soft, rounded, subcutaneous abscess upon the chest, which may ultimately open, and thus form a direct communication between the cavity of the pleura and the external air. Such an abscess may be recognized by the changes it undergoes in the act of breathing, being firm during expiration and soft during inspiration. In some instances, the tumour disappears under pressure, and by change of position, and reappears when these causes cease to act. By whichever outlet the pus escapes, air is apt to enter the cavity, and, by exciting putrefaction in the purulent matter, to occasion fresh inflammation, and thus increase the immediate danger. In all these cases, the result is very doubtful, and the patient not unfrequently perishes in the end. Sometimes death comes suddenly and unexpectedly; sometimes the patient is worn out by hectic, with diarrhœa, dropsical effusion, &c. In consequence of an extension of the pleuritic inflammation to the neighbouring tissues, according to M. E. Leplat, abscesses may form in the walls of the chest, which, whether acute or chronic, have a special tendency to discharge into the bronchial tubes, from the existence of pleural adhesions, and should be promptly opened when observed, in order to prevent any injurious influence on the substance of the lung, or on the ribs. (*Arch. Gén.*, Mai, 1865, p. 595.) Chronic pleurisy may terminate in a few months, or may run on for years. Its danger is much increased by complication with tuberculous, or other organic disease.*

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* Prof. Landouzy, of Reims, has arrived at certain conclusions in relation to chronic pleurisy, which have considerable diagnostic and therapeutic value.

1. *Bronchial and amphoric sounds*, both of respiration and the voice, are observable in a considerable proportion of cases of chronic pleurisy. They occur in cases attended with serous or purulent effusion, or with false membrane with or without effusion, and may persist even after the liquid has been absorbed. They are owing not immediately either to the liquid or plastic matters in the pleural cavity, but to the pulmonary condensation produced by them, and are formed in the large tubes. If, when the sounds cease, there is a return of the respiratory murmur, or of one of the bronchial rales, a diminution of this condensation of the lungs is indicated. If, on the contrary, there is, under the same

Pleuro-pneumonia.—In this there is a combination of the peculiar genei symptoms of pneumonia and pleurisy, of which the viscid and rusty expe toration is most characteristic of the former, and the sharp stitch in the si of the latter. The physical signs of the two affections are also to a great or less degree combined in the case. The crepitation of pneumonia is gen rally heard early in the disease, and, after being quite lost in consequence the accumulation of liquid, sometimes returns when this is absorbed. T friction sound, ægophony, and flatness on percussion indicate the existence pleurisy. Sometimes the two inflammations occupy different portions of t lungs, the pleurisy for example the lower, and the pneumonia the upper. such cases, the peculiar signs of each affection are perceived in the part whi it occupies. But more frequently both affections exist at the same time the lower portion of the lung. Here we have a mixture of the peculiar sig of both. The crepitant rale may be heard at an early period, but is grad ally lost as the liquid in the pleura accumulates, when flatness on percussi supervenes, with bronchial respiration, and, instead of pure ægophony, a mi ture of this with bronchophony, constituting a sort of double voice, which h been compared to that heard in the performance of *Punch.* Chomel stat that this complication was first noticed by himself. Sometimes no respirato sound can be heard unless the patient draw a quick and full breath, as aft coughing; and then the peculiar signs of pneumonia may be perceived. Occ sionally, by changing the position of the patient, pneumonic sounds becon evident, which were before covered by the liquid. Vocal resonance is said l Williams to be greater in pleuro-pneumonia than in either of its compone affections separately; and, indeed, all the auscultatory sounds of pneumon may be increased by pleuritic effusion, when not too copious.

According to Laennec, pleuro-pneumonia is less dangerous, *cæteris pa bus,* than either pleurisy or pneumonia. The compression of the lung by t pleuritic effusion he supposed to diminish the intensity of inflammation in parenchyma; while, in consequence of the less yielding nature of the inflam lung, it diminishes the space for effusion, and renders it more easy of abso tion by limiting its quantity.

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circumstances, an absence of the respiratory murmur and rales, an increase of the c densation, either by liquid or false membrane, is shown to exist; the bronchial tubes the selves being now compressed so as to exclude the air. If the cessation of the bronch and amphoric sounds coincides with enlargement of the intercostal spaces, and displa ment of the viscera, the compression is known to be produced by liquid; if with shri ing of the thorax, false membrane without liquid is the compressing agent.

When these sounds are heard after the tapping of the chest, if unmixed with normal abnormal respiratory murmur, they indicate that the large bronchia alone are open; mixed with the pure respiratory murmur, or with rales, they show that the lung is p tially permeable.

2. *Ægophony,* like the amphoric voice, is a modification of bronchophony, and depe not on the effusion, but on a change of the lung produced by it; as it can be heard i mediately after the evacuation of the liquid.

3. The tympanitic resonance on percussion of the summit of the lung, noticed by Sk as occurring in some cases of old pleuritic effusion, is heard in chronic pleurisy after absorption of the liquid, showing that this sound also depends on a modification of lung itself, and not on the presence of the liquid.

4. *Recent false membranes* may, at the end of two weeks from their production, have tained sufficient consistence to cause amphoric respiration. But, even when thus tended, they are not necessarily refractory, but, after paracentesis, may quite disappe so as to leave no sign to auscultation. If they continue, however, they may form a fibro fibro-cartilaginous, or osteo-fibrous shell or case for the condensed lung, which will p clude it, ever after, from the performance of its functions.

5. If one lung ceases to perform its functions, the duty is thrown upon the other, whi therefore acts with an energy that endangers serious or fatal inflammation.

The practical deductions from these conclusions will be stated in a future note. (*Ar Gén.*, Nov. 1856, p. 690, and Déc. 1856, p. 513)—*Note to the fifth edition.*

Causes.

The most frequent cause of pleurisy, as of so many other inflammations, is exposure of the body to cold, especially when previously heated or perspiring. It is said that cold drinks, under similar circumstances, sometimes produce the disease. Other causes are mechanical injuries, the transfer of irritations from without, the sudden checking of habitual discharges, and the influence of various diseases. Among the most frequent of these are tubercles. They may occasion pleurisy either by a direct irritation from their contiguity to the membrane, or by the discharge of the matter of a vomica, through an ulcerated passage, into the pleural cavity. The latter result is not unfrequently prevented by the adhesions consequent upon the former. Tubercles in the membrane itself may also be the cause of the disease. Inflammation of the lungs is not unfrequently propagated to the pleura; and gangrenous abscesses in the parenchyma, or mortification upon the surface of the lung, sometimes give rise to pleurisy, the former by opening into its cavity, the latter by the contact of its putrescent products. Apoplexy of the lungs is said occasionally to produce it. Inflammation, ulceration, and abscesses of the walls of the chest, if, as before stated, sometimes the effects of pleurisy, are, as well as cancerous or other malignant affections of the same parts, or of the lung itself, not unfrequent causes of the disease. Pleurisy has repeatedly been observed to follow operations for the removal of tumours from the breast and axilla.

The disease is more frequent in men than in women, chiefly, in all probability, because they are more exposed to its ordinary causes. It is common to all ages. The robust and vigorous, and persons of sanguine temperament are said to be most liable to it; and the seasons in which it specially prevails are the winter and spring.

Diagnosis.

The only diseases with which pleurisy is peculiarly liable to be confounded are rheumatism of the intercostal muscles or pleurodynia, pericarditis, and pneumonia. In pleurodynia, the physical signs which have been mentioned as characteristic of pleurisy are wanting, with the exception of the diminished respiratory murmur, and other results of the want of free expansion of the chest in breathing. There is usually also an absence of fever and cough. Besides, in pleurodynia, the pain is often more shifting than in pleurisy, is frequently felt in neighbouring parts, and is more apt to be increased by a twisting motion of the chest. For the means of distinguishing pericarditis, the reader is referred to that disease.

It will be proper to give in this place the diagnosis between pleurisy and pneumonia. In the former, the pain is sharp and severe, and usually concentrated in one spot; in the latter, it is moderate and dull when the pneumonia is wholly uncomplicated; but, as this is generally associated with inflammation of the pleura which invests the inflamed portion of the lung, the symptom is little to be relied on. The character of the expectoration is more important, being viscid and rusty in pneumonia; mucous and transparent, or whitish, or simply streaked with blood, in pleurisy. In the latter, the crepitant rale of pulmonary inflammation is wanting; in the former, the friction sound and ægophony of pleurisy. In both, bronchial respiration may exist; but it is more extensive, and heard over remoter parts of the chest, in pneumonia, than in pleurisy with much effusion. In the latter affection, over the part where compression is greatest, respiration is often scarcely if at all heard, and vocal resonance is wanting; while in pneumonia, with the highest degree of dulness on percussion, bronchial respiration is usually distinct, and the vocal resonance much greater than in health, amounting often to bronchophony. Percussion yields no distinctive sound in the earliest stage; but the dulness is perceived earlier in pleurisy, and the flatness of the advanced stage is more complete. In pleurisy, the flatness often changes with the position of the patient, which is not the case in pneumonia. The whole sternum may be flat in pleuritic effusion, only one-half of it in hepatization. The hand over the seat of copious pleuritic effusion feels no vocal vibration, while in pneumonia it is more striking than in health. In pneumonia, the distension of the chest, flatness or bulging of the intercostal spaces, and the displacement of the heart, liver, stomach, &c., which occur in pleurisy with large effusion, are wholly wanting.

In some cases of partial pleurisy, especially the interlobar and mediastinal, the diagnosis is very uncertain, and at best but conjectural. When, moreover, the disease is unattended with pain and cough, it is very apt to be overlooked. This happens most frequently when the pleurisy comes on in the course, or towards the termination of other diseases. It is, therefore, a good rule, whenever in any complaint a sudden increase of fever, or other material change for the worse occurs, not readily traceable to its cause, to examine the chest minutely, and ascertain whether pleurisy may not exist.

In *chronic pleurisy*, when the effusion is not confined by adhesions, there can generally be little difficulty in making a correct diagnosis. But, when partial and limited by old adhesions, it is not always so easily distinguished. Not to speak of the interlobar and mediastinal forms, which are generally first recognized after death, unless in certain rare cases in which the pus escapes through the lungs, and thus leads to plausible conjecture as to the seat of disease, even the costal cases are occasionally somewhat embarrassing. The flatness on percussion, and the shortness of breath, cough, and other general symptoms are not always sufficient proofs of pleurisy; for they are met with also in pneumonia and phthisis, and may result from tumours within the chest, and even from the enlarged liver pushing up the diaphragm considerably above the ordinary level. Chronic pneumonia, however, is rare; and, besides, some bronchophony and bronchial respiration may be heard, which is not usually the case in pleurisy, unless in those points at which the lung adheres to the chest, and which may be distinguished by their strong contrast with the part in which the flatness is perceived. In phthisis the dulness is usually confined to the upper part of the chest, and various sounds are perceived by auscultation, which are wholly wanting in pleurisy. (See *Phthisis.*) Neither in pneumonia, nor in tuberculous cases, does the dulness on percussion equal that produced by liquid effusion. In relation to tumours, in which there is the same flatness, and the same absence of auscultatory sounds as in pleurisy, the discrimination must be founded on a survey of the origin and course of the complaint, and its general symptoms, and on the fixed character of the physical signs. The same is the case with enlarged liver, in which the symptoms of chronic hepatitis, or the existence of some cause in the abdomen calculated to push the viscus upward, would be apt to lead to a correct conclusion. Pleuritic abscesses in the vicinity of the heart occasionally appear upon the surface as pulsating tumours, and might possibly be mistaken for aneurism, from which, however, they differ in the symptoms attending their origin and progress, and in the absence of the aneurismal thrill and murmur. Besides, there are sometimes two of these tumours, one before and one behind, or otherwise separate, which obviously communicate; and in this respect also they differ from aneurisms. But they should not be opened until after examination by a grooved needle to determine whether they contain pus.

Prognosis.

Simple pleurisy of one lung almost always terminates favourably, if treated properly in the earlier stages. When copious effusion has taken place, the cure is more uncertain, but may generally be effected in uncomplicated cases.

It is usually by association with other diseases that pleurisy acquires great obstinacy, and becomes very dangerous. Thus, when it occurs in the course of febrile affections, or in persons debilitated by some wearing complaint, it increases the danger, and not unfrequently hastens the fatal issue. Perhaps the most frequent cause of its obstinacy is the existence of tubercles in the lungs. Hence, an intractable character, or disposition to very frequent recurrence in pleurisy, is a reasonable ground for apprehending the existence of latent phthisis. Coexisting organic disease of the heart, liver, or kidneys, adds to the danger of the complaint. It is more serious in the old than in the young and vigorous; because in the latter, independently of their greater ability to withstand disease in general, there is a tendency to the exudation of fibrin, and to consequent adhesion of the pleura, while in the former the disposition is to the effusion of serum or formation of pus, both of which interfere with the curative process. Indeed, pus in the pleural cavity is always very hazardous. Purulent expectoration, hectic fever, and emaciation are very unfavourable signs in this complaint; as is also the escape of pus through the walls of the chest; though in both cases recovery sometimes takes place. Double pleurisy may always be regarded as a very serious affection.

Treatment.

Acute Pleurisy.—At an early period of the disease, the lancet should be freely employed. Few diseases bear bleeding better, or call for it more strongly than acute pleurisy. The patient should be placed in a sitting posture in bed, and the blood allowed to flow until a decided impression is made upon the pulse, or some degree of sickness of the stomach or faintness is produced. From twelve to twenty-four ounces may usually be taken at the first operation. The disease is thus not unfrequently arrested at the outset, or rendered so mild as no longer to be an occasion of solicitude. Should the sharp pain not have ceased, or should it return after having been mitigated, the bleeding may be repeated in the same or the subsequent period of twenty-four hours; and, indeed, again, if the pain call for it, and the pulse permit. Even after the pain has ceased, should the pulse remain strong, without cardiac hypertrophy, and the physical signs afford evidence of a progress of the inflammation, the lancet may still be resorted to. Nor is this remedy to be limited by time. No matter what may be the period of the complaint, the coexistence of pain and a strong pulse indicates the remedy; but less blood must be taken at once in the advanced than in the early stages.

After the first bleeding, the bowels should be thoroughly evacuated by sulphate of magnesia, the infusion of senna with salts, or calomel combined with or followed by an active cathartic. Subsequently, throughout the complaint, it will generally be sufficient to keep them opened once daily; for which purpose the saline laxatives, castor oil, or enemata may be used if necessary.

The bowels having been unloaded, and the febrile symptoms reduced by the lancet, opium and ipecacuanha in the dose of a grain each, combined with two or three grains of calomel, may be given at bedtime, if the pain should be sufficient to prevent sleep. During the day, small doses of tartar emetic may be given every two or three hours, with the effervescing draught or neutral mixture when the skin is hot and dry.

Should the inflammation continue after the pulse has been subdued by general bleeding, leeches or cups may be freely applied to the chest, and followed by an emollient poultice; great care being taken not to allow the moistened skin to be exposed to the cool air. At the end of the third, fourth, or fifth day, after depletion has been sufficiently employed, great advantage will often accrue from a blister over the affected part. This should be large, eight by ten inches for example, and kept on in the adult ten or twelve hours, or even longer, should it not have drawn previously.

At the same period, if the effusion be considerable, and the general symptoms do not indicate a speedy and favourable issue, it will be proper to employ mercury, which should be given in moderate doses, and at short intervals, until the gums are touched, when it should be suspended. Calomel is in general preferable to any other preparation, though the blue mass may be substituted, if the former prove too irritating to the stomach or bowels. Sometimes it is advisable to associate the mercurial with opium; but it will generally be sufficient to give this narcotic at night, as before recommended.

After the decline of the fever, should effusion remain, attempts may be made to promote the absorption of the liquid by squill in connection with calomel, if this be still administered, and with digitalis, if there should be a frequent pulse and no great debility. Seneka is also useful, when catarrhal symptoms coexist with those of pleurisy. If these measures fail in producing absorption of the liquid, nitre freely given in a large proportion of water, or cream of tartar may be substituted; and colchicum, muriate of ammonia, and iodide of potassium are recommended by some writers. Nitre is peculiarly appropriate when some febrile action continues, and may, under these circumstances, be given in conjunction with the mercurial and digitalis, instead of squill. Repeated blistering is also here a most valuable remedy.

In the treatment of pleurisy, reference must always be had to the state of the system; and, when this is asthenic, depletion must be employed with caution, and the mercurial practice commenced earlier. In such cases, it will often be sufficient to leech or cup instead of bleeding. Blisters may often also be very promptly applied. In *bilious pleurisy*, purging with calomel, and an early recourse to the mercurial impression are usually indicated; and, as in the case of the same variety of pneumonia, quinia should be used freely when the disease assumes an intermittent form, or even when it is distinctly remittent, provided there be at the same time a typhoid tendency. The observations made under typhoid pneumonia are applicable to pleurisy when similarly complicated. When pleurisy is associated with tubercles, should the loss of blood be deemed necessary, cupping should be substituted for the lancet, and, if mercury be employed, care should be taken that it be not allowed to produce a deep effect, or to act long upon the system, lest it might favour their further deposition. Blisters are here peculiarly indicated.

The diet in acute pleurisy should be very low, consisting, in the early stages, chiefly of the mucilaginous and farinaceous liquids, and, at a somewhat more advanced period, of toasted bread and tea, fresh fruits as oranges or grapes, and stewed dried fruits or preserves. Refreshing acidulated drinks may be allowed freely. The patient should be kept at rest, and should avoid speaking or coughing as much as he conveniently can. He should lie with his shoulders and chest somewhat elevated with pillows. It is important that the temperature of the chamber should be uniform, and comfortably warm, day and night. Caution must also be employed not to expose the naked chest, unnecessarily, in any physical exploration which may be deemed requisite.

Chronic Pleurisy.—Occasionally, in this form of pleurisy, moderate bleeding is admissible; but in general, when the loss of blood is indicated, local measures are preferable. The existence of pain with sufficient strength of pulse offers the requisite indication. Blisters are here invaluable. They should follow each other rapidly, or be kept constantly open by stimulating dressings. I prefer the former plan, as a more copious discharge may thus be obtained. Free pustulation with tartar emetic, and, in very chronic cases, issues or setons, may be substituted for blistering. Of internal remedies the most effective are probably combinations of calomel, squill, and digitalis. Seneka may sometimes be advantageously added, or substituted for one of the two latter ingredients. With the view of promoting absorption, iodide of potassium, or of mercury, or the compound solution of iodine, may be used internally, and the ointment of iodine applied to the surface by means of friction. Mercurial frictions will sometimes also be found useful. Opium, hyoscyamus, or some other narcotic should be employed to allay cough. When hectic symptoms appear, they must be combated by mild tonics, such as infusion of wild-cherry bark, the mineral acids, and the chalybeates, including iodide of iron, and by sulphate of quinia, if the debility is considerable. Opium should also be given, and the diet should be nutritious without being stimulant. In doubtful cases, milk with the farinaceous substances, fresh vegetables, and fruits should be used; and, in greater debility, the light kinds of animal food, as eggs, oysters, broths, and boiled meats.

Empyema.—Whether in the acute or chronic form of pleurisy, when the liquid in the chest is so copious as to threaten immediate suffocation, recourse should be had to the operation of paracentesis. This operation is also called for in chronic cases, when all other measures have failed to remove the fluid, and life is endangered by its continuance in the chest. A consideration, in these cases, strongly in favour of a somewhat early recourse to the operation, is that the plastic exudation becomes firmer and more unyielding the longer it continues, and that, consequently, the longer the liquid is allowed to remain in the chest, compressing the lungs, the more apt will these be to become irrecoverably fixed by the inexpansible new tissue that binds them down. Whenever, therefore, progress ceases to be made in producing absorption of the effused liquid, after a fair trial of the remedies adapted to this purpose, the practitioner would be justified, in cases in which the future capacity of the lung to perform its office might be endangered, in resorting to this method of relief.* Though it often fails to effect cures, and though it sometimes aggravates the inflammation of the pleura, probably by the admission of air into the cavity, and the consequent chemical changes produced in the contained liquids, yet it generally affords temporary relief, often protracts life, and sometimes saves it. Out of 16 cases recorded by Dr. Davies, in which the operation was performed, 12 recovered; but this is an unusually large proportion in chronic pleurisy; and it is highly probable that many of them might have been relieved without it. Of 75 patients operated on by Dr. H. J. Bowditch, of Boston, 29 perfectly recovered; and no permanent injury resulted from the operation in any case. (*Am. J. of Med. Sci.*, Jan. 1863, p. 17.) The operation is more successful in serous than purulent accumulation, but the necessity for it is greater in the latter. The nature of the liquid may be ascertained by introducing a grooved needle, which may be done with little pain, and almost no risk. The quantity of fluid which has sometimes been discharged is enormous. A case is mentioned by Dr. Townsend, in which fourteen imperial pints were drawn off by Mr. Crampton, of Dublin.

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* The reader will please refer to the note at the foot of page 49, for certain facts stated by M. Landouzy, which have a strong bearing upon the subject of the early performance of paracentesis. The practical inferences which M. Landouzy draws from them are the following, coinciding mainly with the recommendations in the text. 1. In all cases of pleuritic effusion, efforts should be made to promote absorption both of the liquid and plastic matters, in order to prevent their conversion into inextensible tissue which might permanently bind down the lung. A case of pleurisy should not, therefore, be left to nature. 2. As soon as the efforts of nature and the influence of remedies are found to fail in lessening the effusion, provided it be not dependent on disease of the heart, blood, lungs, or kidneys, or associated with an incurable cachexy, recourse should be had to paracentesis. 3. If there is amphoric respiration, independent of tubercles or pulmonary fistulæ, the operation should be immediately performed. 4. The same occasion for immediate action exists, whatever may be the cause of the effusion, if it threaten speedy death. 5. If the void resulting from atrophy or compression of the lungs is promptly filled after the operation, by the expansion of the lungs or the shrinking of the thorax, the prognosis is favourable; but if a large pus-producing cavity remains, there is reason to apprehend a fatal issue. 6. If the liquid is serous, injections after the operation are useless; if purulent, the cavity should first be washed out by a slightly chlorinated liquid, and afterwards iodine injections used; if fetid, or very rapidly reproduced, instead of leaving any kind of instrument in the puncture to keep it open, which must have the effect of irritating the pleura, the puncture should be converted into an incision. (*Arch. Gén.*, Déc. 1856, p. 704.)—*Note to the fifth edition.*

Writers differ upon the questions, whether the liquid should be drawn off wholly at once, or by successive operations, and whether the orifice should be closed or left open. When the quantity of the liquid is large, and the whole is taken away at once, it is thought that the consequent entrance of air into the cavity must prove injurious by giving rise to inflammation of its walls; and the fact is, that, after the operation, the fluid if before serous is apt to become purulent, and if purulent, to undergo putrefaction; and the danger of the case may thus be aggravated. When the liquid is serous, and not in itself irritant, and when there is reason to think, from the period of the disease at which the operation is performed, that the lung may retain a considerable degree of expansibility, it appears to me best that such a portion only should be drawn off at once as will flow out readily, under the force of the contracting chest and the dilating lung. The plenum is thus preserved, and no air admitted; and, before a second operation is performed, the lung will probably acquire a still greater expansibility, and the chest a still greater contractile power, so that more may flow out without solicitation. In this way, it is possible that an equilibrium may be preserved between the diminution of the fluid, on the one hand, and the supplying expansion of the lung and contraction of the thorax on the other, until the parts are restored to their healthy state. Sometimes only one operation is necessary; as nature, assisted by remedies, is competent to the removal of the remaining liquid. But, if the liquid be pus, as much should be withdrawn as possible; and it is even recommended by some to withdraw it by means of a syphon, or a suction instrument. It is also recommended to wash out the pus by the injection of warm water.

In relation to the question whether the wound should be closed or left open, the answer must depend upon the nature of the fluid. Should it be serum, it will be obviously proper to close the wound, so as to obviate the danger of inflammation from the admission of air, or the imperfection of the cavity. If it be pus, and this have a tendency to accumulate rapidly, the wound should be allowed to remain open, so that the liquid may escape as rapidly as it forms. If, therefore, the wound be closed after the first operation, and the cavity become again speedily distended, there can be little doubt that subsequently the external communication should be kept free, and nature imitated in the process by which she sometimes effects a spontaneous cure through an external opening. It may, however, possibly happen that the cause producing the pus has ceased in great measure to operate, and that the quantity drawn off may be replaced slowly if at all. In such a case, it would be fortunate that the danger of inflammation from a permanent imperfection of the cavity should have been avoided by a closure of the orifice.

When the pus discharged is offensive, and the parts exhibit no tendency to a recovery of their healthy state, it has been recommended to inject antiseptic and moderately stimulant liquids, such as a weak solution of creasote, or of one of the chlorinated compounds. Several successful cases have been recorded from the use of iodine injections. The pus having been washed out by a mucilaginous injection, as of decoction of marsh-mallow, a solution composed of one part of iodide of potassium, ten parts of tincture of iodine, and a hundred parts of water, making altogether about four fluidounces, may be thrown into the cavity every two or three days; and the strength of the injection may be increased as the parts become accustomed to the impression. (Boinet, *Archives Générales*, 5e *sér.*, i. 523.) The strength of the injection has been increased, in some instances, to equal parts of tincture of iodine and water, with enough iodide of potassium simply to prevent the precipitation of the iodine on dilution. Sometimes the iodine, used in this way, has produced its effects on the system, causing irritation in the nostrils and air-passages, profuse salivation, &c. (*Ibid.*, Août, 1856, p. 182.)

In some very obstinate cases, the plan of "drainage" has been tried successfully. It consists in making two openings into the cavity, and introducing Chassaignac's tube for the healing of sinuses, which is made of caoutchouc, and perforated at frequent intervals, so as to admit the entrance of liquid at any point along its course. The counter opening should be made at the lowest point of the cavity, and the drainage tube should not be withdrawn as long as pus continues to be discharged. By thus keeping the pleural cavity empty, the lung has an opportunity to expand, and to fill the cavity, which would otherwise be maintained by the continual formation of pus. (Dr. S. J. Goodfellow, *Medico-chirurgical Trans.*, xlii. 231.) One instance of death after the operation is recorded in the *Lancet* (July 29, 1865, p. 118).

The method of performing the operation of paracentesis belongs to surgery. It will be sufficient here to state, that the operator should be perfectly satisfied of the existence of liquid at the spot where he makes the opening, lest he should wound the lung, or the liver, if this should happen to have encroached upon the thorax. As a general rule, the space between the fifth and sixth ribs should be preferred. In the upper part of the chest, adhesion is apt to exist; in the lower, the liver might be in the way.

In relation to the treatment of *pleuro-pneumonia*, no special instructions are necessary. The practitioner who understands how to treat each disease separately, will have no difficulty in deciding upon his measures when the two are conjoined.

Article IV.

PNEUMOTHORAX.

This name, first applied by M. Itard to the affection in which air is contained in the cavity of the pleura, has been generally adopted. To Laennec belongs the merit of having first fully investigated the subject; and little has been added to what was taught by him. The affection scarcely deserves to rank as a disease; being a mere incident in the course of several very different complaints and injuries of the respiratory organs.

Pneumothorax may exist in three different forms; 1. that in which the cavity of the pleura has no communication with the external air; 2. that in which it communicates with the air through the bronchial tubes; and 3. that in which the communication is directly through the walls of the chest. The second is by far the most common, and sometimes coexists with the third. Another distinction might be founded on the presence or absence of organic lesion; but the latter condition is comparatively so rare, that it might almost be considered as an anomaly scarcely worthy of notice. Still another distinction has been made, dependent on the presence or absence of liquid in the cavity; and the name of *hydro-pneumothorax* has been proposed for the variety which is characterized by the former condition, while *pneumothorax* simply is retained for that in which there is only air. This nomenclature, however, has not been generally adopted, and the simpler title is usually employed to express the two varieties indiscriminately. It is a rare event to find air quite alone in the pleural cavity.

Symptoms.—The general symptoms are very equivocal, and altogether insufficient to serve as a basis of a confident diagnosis. Dyspnœa, dependent upon the compression of the lung, is an almost constant symptom. It varies greatly in degree, according to the amount of air and liquid within the cavity of the pleura, to the rapidity and permanence of the accumulation, and to the state of the opposite lung. Sometimes the quantity of air and liquid combined is so small as to occasion but slight compression of the lung, in which case there may be little inconvenience of breathing from this cause. When the accumulation is gradual, the organs of respiration and circulation accommodate themselves, in some measure, to the new condition of things, and the suffering is less than under opposite circumstances. It happens, however, most frequently, that the entrance of air into the cavity is sudden. In that case, severe dyspnœa usually comes on immediately, attended frequently with sharp pain in the side, and sometimes with a sensation as if something had given way in the chest. Occasionally these sudden attacks are marked by the occurrence of a copious expectoration of pus, consequent upon the opening of the pleural cavity, in a state of empyema, into the bronchia. It may happen that the opening, which admits air into the cavity during inspiration, shall be large or free enough to admit its ready expulsion during expiration. In such a case, excessive pressure upon the lung may not occur, and the dyspnœa may not be exceedingly violent. In other instances, on account of the orifice being under the surface of the liquid in the cavity, or of its having a kind of valvular arrangement, the air admitted during inspiration is either not expelled at all, or only partially so during expiration, and consequently goes on accumulating, and thus compressing the lung, until suffocation ensues, unless through change of position, violent effort, or other cause, the air can find an exit. The fatal issue, under such circumstances, may take place very speedily, and is preceded by the most painful and laboured breathing, intense anxiety, and universal prostration. When one lung is from previous disease unfit for duty, and pneumothorax occurs upon the opposite side, speedy death is almost inevitable.

When the communication first takes place between the lung and the pleural cavity, there is not only dyspnœa, but often also a sharp pain in the side, and severe cough, in consequence of irritation of the membrane. The irritation is sometimes so intense as to be attended with a temporary depression of the vital functions; but inflammation and febrile reaction soon follow. These effects are usually ascribed to the direct influence of the air upon the pleura; but when it is considered how innoxious is air in the areolar tissue, as in emphysema, this explanation must be received with hesitation; and the probability appears much greater, that the real source of irritation is the liquid, often highly acrid, which is at the same time admitted into the cavity from tuberculous vomicæ, gangrenous abscesses, &c. Should liquid have pre-existed in the cavity, the admission of air may prove the source of irritation indirectly, by causing putrefaction in the liquid. The patient generally prefers the sitting posture, or, if he lies down, does so of choice upon the side affected, at least after the first violence of the pleuritic pain has subsided.

The *physical signs* afford the only certain evidence of this affection; and these are quite distinctive. Sometimes there is distension of the chest, with enlargement and bulging of the intercostal spaces, and displacement of the neighbouring viscera, as in copious liquid effusion; but these effects are not constant. When the air is between the ribs and lung, percussion yields a clear, drum-like sound, much clearer than upon the corresponding part of the healthy side, and of a different character, being analogous to that produced by percussion over the stomach. If liquid exists in the cavity at the same time, percussion produces over it a flat sound, strongly contrasting with the tympanitic sound occasioned by the air; and the limits of the resonance and dulness are often well defined, and vary with the position of the patient, the former occupying a place in the chest above that of the latter. Thus, if the patient sit, the clearness will be in the upper and the flatness in the lower portion; if he lie upon his back, the former will be anterior and the latter posterior, and *vice versa*. But this sign is of itself not sufficient; for the difference between the sound of the lung in health, and the sonorousness of pneumothorax is not always to be depended upon. Auscultation here lends its aid and supplies the deficiency. The ear, applied to the chest, perceives no respiratory murmur in the part where the sound upon percussion is clearest; while, at the corresponding spot on the opposite side, the percussion is less clear, and the respiration heard distinctly. The vocal resonance, and vibratory thrill of the walls of the chest are also less over the tympanitic than over the healthy part. These signs, taken in connection with the movable limits of the dulness and sonorousness, are peculiar and distinctive. Sometimes, owing to adhesions of the lung to the side, respiration is heard; but other sonorous parts exist where the sound is wanting. If the quantity of air is very great, and no adhesions exist, the respiratory murmur is nowhere audible except near the root of the lung. Besides this sign, there are others which belong equally to this affection, and to large cavities in the lung. Such are the amphoric respiration, amphoric resonance of the voice and cough, and metallic tinkling. For the value of these signs, the reader is referred to the remarks preliminary to the subject of diseases of the respiratory organs. (See *vol.* i., *pages* 889, 892, and 899.) Of course, the two first are heard only when the cavity communicates with the bronchia, and the last most frequently under the same circumstances, though the metallic tinkling may be occasionally produced in the closed cavity, as for example by change of position, when drops of the liquid which has adhered to the surface now uncovered fall into the mass of liquid beneath, and by rales in the bronchial tubes, &c. Still another sign is the sound of fluctuation or splashing, which is sometimes heard, especially if the ear be applied to the chest, during succussion, that is, a quick and sudden movement of the body, as when shaken by a person having hold of the shoulders. This sound is produced only when there is a considerable quantity of liquid along with the air. It is often audible to the patient in moving. M. Aran has called attention to another sign, sometimes offered in this disease; a shock, namely, occurring during the cough, giving to the patient a sensation as though something were striking against the costal pleura, and resembling to the ear, or to the hand of an observer, the blow of a hammer. This was observed a little below the lower angle of the scapula, and was ascribed by M. Aran to the lung, floating upon the liquid in the pleural cavity, and, when distended in inspiration, striking against the wall of the chest. (*Arch. Gén.*, Août, 1856, p. 156.)*

The course of this affection is various, being dependent on the nature of the disease of which it is an attendant. Sometimes it is very speedily fatal, within an hour, or a few hours, or a few days, and, when produced by the rupture of the pleura in tuberculous and gangrenous affections of the lungs, generally in the course of a week or two. Sometimes, however, it runs on for months and years, and cases are on record in which it continued for three and even six years. The termination is usually sooner or later in death, though recoveries do occasionally take place, especially when the affection has originated in pleuritic effusion. Sometimes the symptoms of phthisis are ameliorated after perforation of the pleura.

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* A new sound, which when heard is pathognomonic of pneumothorax, is described by M. Morel-Lavallée, under the name of *bruit du moulin*, or mill-sound, so called from its resemblance, both in its nature and regularity, to the sound made by the paddle of a mill-wheel, striking the water and air successively at equal intervals. It is produced by the heart beating against air and liquid, and though heard at a considerable distance, its greatest intensity is in the cardiac region. In the two instances in which it was noticed by M. Morel-Lavallée, it was heard when the patients lay on the back, and in the only instance in which the state of the patient allowed him to sit up, it was no longer heard in this position either before or behind. (*Arch. Gén.*, Juillet, 1863, p. 111.)—*Note to the sixth edition.*

Causes.—By far the most frequent cause of pneumothorax is the opening of a tuberculous vomica, already communicating with the bronchia, into the cavity of the pleura. Hence the affection is not a very uncommon accompaniment of phthisis. The opening is made either by ulceration, or by the rupture of the membrane over a superficial vomica, in consequence of some violent action of the chest, as in a paroxysm of coughing. As a communication is thus established between the cavity and the external air, this of course enters the pleura at every expansion of the chest, and, if the communication be perfectly free, passes out again in great measure during expiration, only so much remaining as may be necessary to occupy the space left by the elastic contraction of the lung. Should the exit, however, be less free than the entrance, the air goes on accumulating in the cavity, and the lung becomes very much compressed. In general there is only one opening, but sometimes there are several. As the tubercles producing them are seated usually in the upper part of the chest, the opening is most commonly found in the same part. In this variety of pneumothorax, the attack is often very sudden; for, though the ulceration may make its way gradually to the surface of the lung, yet, when the pleura only remains, this is apt to give way under some more than usual violence, and the phenomena at once occur.

Upon the same principles, pneumothorax occasionally arises from gangrenous or phlegmonous abscesses of the lungs, and hemorrhagic effusions in their tissue, making a passage into the pleural cavity; and the progress of cancerous ulceration, and the rupture of a hydatid, have led to the same result. But all these cases are very rare.

In some instances, the opening is made from the pleura into the lungs. This happens in cases of empyema, in which the pus excites inflammation and ulceration in the pleura, and by the same processes opens a passage through the pulmonary parenchyma into the bronchial tubes, and is discharged. Sometimes it makes its way externally through the walls of the chest, and thus establishes a direct communication between the cavity and the outer air. In either of these modes, pleurisy may be the cause of pneumothorax.

The operation for empyema, and other penetrating wounds of the chest, occasionally give admission to the air through its walls; and, when the lung is penetrated at the same time, from the bronchial tubes also. A fractured rib sometimes causes pneumothorax by wounding the lung; and the same result is said to have been produced by violent compression from without, rupturing the pulmonary air-cells and pleura. In an emphysematous state of the air-cells, it sometimes happens that the superficial cells are ruptured in violent paroxysms of dyspnœa, and the air, escaping beneath the pleura, ruptures that also, and enters the cavity.

In all the cases hitherto alluded to, there is an external communication. But the affection sometimes occurs without such communication. Occasionally a portion of the surface of the lung becomes gangrenous, and the gases arising from its decomposition are confined in the pleural cavity. Ulcerous communications have also been formed between the hollow abdominal viscera and this cavity, which has thus been filled with air. In some rare cases of partial pleurisy, in which the liquid effusion is limited by adhesions, it is said that the place of the liquid absorbed is sometimes supplied by air; the lungs not being sufficiently expansible, nor the ribs sufficiently flexible to fill up the vacuity. It is probable that the air, in such cases, proceeds from the liquid, which always contains more or less of it under the ordinary atmospheric pressure, and yields it when that pressure is removed. Sometimes the liquids contained in the cavity of the pleura, especially when mixed with blood, undergo decomposition, and give out gaseous matter. Again, it is thought that, in some rare instances, air is extravasated from the pleura, without any observable organic lesion. Such an event may happen in certain low states of the system analogous to those in which a similar extravasation of air takes place into the cells of the exterior areolar tissue. It is possible that the air occasionally found in the pleural cavity after death, without any discoverable organic affection, may be the result of the debility immediately preceding death, or even a pure cadaveric phenomenon.*

In relation to the comparative frequency of the foregoing causes of pneumothorax, it is stated by M. Saussier that, of 147 cases of the affection, it was in 81 the result of phthisis, in 29 of pleurisy, in 8 of gangrene of the lungs, in 5 of emphysema, in 3 of hydatids, in 3 of wounds; while none of the other causes enumerated had produced more than one case. (*Dict. de Méd.*, xxv. 236.)

The nature of the gas in pneumothorax depends on the cause of the affection. Sometimes it is inodorous, as when derived immediately from the atmosphere; sometimes highly offensive, as when the product of gangrene, or of putrefactive decomposition of the pleural liquid.

The lung is sometimes pressed against the spine, sometimes into the upper part of the chest, and very rarely into the anterior part. The degree of compression varies greatly. In some instances, it is so slight as scarcely to be sensible; in others, the lung is reduced to the size of the fist or even less. Sometimes it is much limited by adhesion of the lungs. There is occasionally much difficulty in finding the fistulous opening after death.

Though generally fatal, pneumothorax is not necessarily so, even when dependent on phthisis. Dr. Woillez has shown that perforations of the lungs by tubercles are sometimes closed spontaneously by false membrane, connecting the parts around the orifice with the opposite costal pleura; and that, after this has taken place, the signs of pneumothorax may gradually disappear. (*Archives Gén.*, Déc. 1853, p. 695.)

Treatment.—This is usually directed less to the removal of the air contained in the pleura, than to the relief of the attendant symptoms. Immediately upon the occurrence of a sudden attack, it is often proper to allay irritation and obviate depression by opiates and sinapisms. The subsequent pleuritic inflammation must be combated by such an amount of depletion, either by the lancet or preferably by leeches, as the patient can bear, by emollient poultices, blisters, or antimonial pustulation, by refrigerant laxatives and diaphoretics, and, if the case be not tuberculous, by a moderate mercurial impression. At the same time, the various remedies mentioned under pleurisy, as fitted to produce absorption of the effused fluid, should be employed. Opiates or other narcotics should be given to allay cough; and, when symptoms of hectic appear, with night-sweats and emaciation, the strength of the patient must be supported by tonics and nutritious food. The only measure directed especially to the air in the pleura, is the making of an opening through the walls of the chest in order to let it out. This is warrantable only where the accumulation is so great as to threaten speedy suffocation. The operation should be performed as in empyema. Sometimes it affords instantaneous relief; and, if the pneumothorax depend upon remediable causes, may be the means of saving the life of the patient. But generally it is only palliative; and, in the advanced period of phthisis, when death must ensue ere long in the ordinary progress of the disease, the performance of the operation, for the sake of a few days respite, is, to say the best of it, of equivocal propriety. M. Aran has punctured the chest and injected tincture of iodine, as in ordinary cases of chronic pleurisy, with relief to the patient (*Arch. Gén.*, Août, 1856, p. 153); and M. Trousseau has succeeded in curing, by the same remedy, three cases diagnosticated as pneumothorax, in which the affection was the result of simple pleurisy. (*B. and F. Med.-chir. Rev.*, Jan. 1858, Am. ed., p. 197.)

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* In the *Dublin Quarterly Journal* (Nov. 1863, p. 296), Mr. Wm. Swayne Little, of Sligo, Ireland, reports a case in which, in a previously healthy individual, an acute attack of pleurisy was attended, along with some liquid in the pleural cavity, with a collection of air, so great as very much to dilate the affected side of the chest, to produce bulging of the intercostal spaces, to force the mediastinum towards the opposite side, and to compress the lung into a solid mass. Death from asphyxia was the consequence; and on examination no communication with the lung was discoverable; the integrity of the pleural sac being perfect. The air was mainly atmospheric air, as it was incombustible, and supported the combustion of a taper as ordinary air. There was no discoverable decomposition of the effused liquid; and no other solution of the problem remains than that the air was exhaled from the inflamed pleura. This is, perhaps, the first unequivocal case of the kind on record. (*Note to the sixth edition.*)

Article V.

EMPHYSEMA OF THE LUNGS.

THIS name has been applied to that affection of the lungs in which their tissue is morbidly distended with air. There are two varieties of the affection; one in which the dilatation is confined to the air-cells, the other in which the air has escaped from the vesicles into the extravesicular or interlobular areolar tissue, or upon the surface of the lung beneath the pleura. The former was called by Laennec *vesicular emphysema*, the latter may very properly be designated as *extravesicular*. The complaint is not uncommon, but has not been well understood until recently. Laennec gave the first satisfactory and consistent account of it, though many isolated facts had been recorded by previous pathological anatomists.

Anatomical Characters.—In *vesicular emphysema*, the lung does not collapse on the opening of the chest, but sometimes on the contrary expands, as if previously compressed by the ribs and diaphragm. This is ascribed to an inelastic or rigid condition of the membrane which forms the cells, consequent probably upon a sort of hypertrophy which not unfrequently thickens the walls of distended cavities. In consequence of this rigidity, they do not contract upon the air which they contain, and therefore remain distended. The lung is very light, and does not sink so much in water as in the sound state. It crepitates less upon pressure, has a firmer feel, and pits under the finger. The surface is sometimes irregular in consequence of unequal projecting vesicles, and occasionally single vesicles are observed, sometimes as large as a pea or larger, of a globular form, and apparently attached by a pedicle. This, however, is only a contracted portion of the vesicle, which continues beneath into the substance of the lung. That these are distended air-cells and not extravasated air, is proved by the circumstance, that they cannot be moved from place to place under the pleura by pressure. If the lung is distended by blowing into it, these vesicles appear to flatten and sink away; but the fact is, that they remain unaltered, while the sound structure around them swells to their level.

When the diseased lung is cut into, the air-cells are found to be in various degrees enlarged, generally to about the size of a millet-seed, sometimes to that of a hazel nut; and occasionally one is observed of much greater magnitude. The smaller cavities are probably mere dilated vesicles, the larger are sometimes produced by the rupture of the intervening coats, and the gradual absorption of the torn membrane. In order that the structure may be well exhibited, the lung should be fully inflated and dried before being sliced; and, in order to compensate for any air that may escape through the membrane, the inflation should be repeated now and then during the drying process.

In consequence of the distension of the cells, the whole amount of surface over which the blood-vessels can ramify is lessened, and these, therefore, undergo absorption. There is consequently a diminished supply of blood, and the portions of lung affected have a whitish appearance, which sometimes contrasts, in a marked degree, with the colour of the healthy parts. The lung is also less moist than in health.

The dilatation may affect only one or a few cells, or may occupy isolated spots, as single lobules, for example, while others remain unchanged, or may extend to large and continuous portions of the parenchyma. It may be confined to one lung, or may affect both. The latter is most frequently the case. When one lung only is the seat of the complaint, it is much larger than the other, so as sometimes observably to displace the mediastinum and heart. The dilatation is more frequent in the upper portion of the lung, and at its borders, than elsewhere. The edge of the lobes is sometimes irregularly fringed with the projecting dilated vesicles, of different sizes. The small bronchial tubes are usually also dilated in the emphysematous part.

Extravesicular Emphysema.—In this variety, the air is sometimes effused upon the surface of the lung, underneath the pleura, producing little bladders of various size and form, in some instances not larger than a shot, in others as large as an egg, and even larger. An instance is mentioned by Bouillaud, in which the bag of air was equal to a common stomach in size. The affection differs from that in which the vesicles are dilated in the circumstance, that, in the former, the air can be pressed from point to point beneath the pleura, while in the latter the vesicles are not movable. The effusion results from rupture of one or more air-cells. Sometimes the pleura gives way, and the air escapes into its cavity, constituting pneumothorax.

In some cases, the air is effused into the interlobular areolar tissue; and the affection, under these circumstances, is named by Laennec *interlobular emphysema.* The partitions of areolar matter between the lobules, which in health can but just be distinguished by the eye, are now much expanded, being from a line to half an inch, and sometimes nearly an inch in thickness. On the surface of the lung they appear as translucent bands, sometimes running in parallel directions, but frequently intersecting each other, so as to form lozenge-shaped spaces of sound lung. If the effusion of air takes place near the root of the lung, it escapes into the mediastinum, and thence into the areolar tissue of the neighbouring parts of the neck, which thus become emphysematous; and the affection may extend to the areolar tissue underneath the skin, and among the muscles, over the whole body. Though the emphysema, in this case, is dependent on some solution of continuity in the air-cells or bronchial tubes, this cannot be detected. The proper cells of the lungs are generally not themselves dilated; though sometimes this kind of emphysema is associated with and dependent upon the vesicular variety.

Rilliet and Barthez state that, in children, they have almost always found inflammation of the bronchial tubes, or of the parenchyma; though these lesions have not generally occupied the same portion of the lung as the emphysema. (*Maladies des Enfants,* i. 187.)

Symptoms.—Very slight emphysema cannot be certainly detected either by the general symptoms or physical signs, and is first known to have existed after death. When so considerable as to produce observable effects, it is always attended with dyspnœa, which, in very mild cases, may be occasional, appearing only under the influence of exciting causes, but, in those of a higher grade, is in a greater or less degree continuous and unceasing. In the latter cases, however, it varies exceedingly, being sometimes quite tolerable, at others exacerbated into the most distressing paroxysms, similar to those of spasmodic asthma, with which this affection was formerly confounded. These paroxysms occur quite irregularly, whenever, indeed, the patient may happen to be exposed to causes which call for more than ordinary exertion of the lungs, or in any degree tend to cramp their action, such as violent muscular effort, elevated situations where the atmosphere is rarefied, the horizontal position which throws the weight of the bowels partly upon the diaphragm, flatulence and overloading of the stomach, which act in the same manner by confining the lungs, and, above all, acute catarrhal attacks. As one of the consequences of the dyspnœa, the patient usually prefers the erect position, and in some instances finds it difficult to lie with his head low. Cough is a very frequent attendant; but is rather a result of some concomitant disease than of the emphysema itself. It is not, as Laennec appears to have believed, invariably present in the complaint. Sometimes there is either no expectoration, or only of a small quantity of clear and viscid or frothy mucus; but, in other cases, and especially when the patient labours under a catarrhal attack, there is a copious discharge from the bronchia, which affords considerable relief to the dyspnœa. When not complicated with acute inflammatory affections, the complaint is entirely free from fever, and the pulse is usually slow and regular. During the paroxysms, the face often exhibits the usual marks of imperfect aeration of the blood, being pale or livid, with purple lips; and in bad cases there is sometimes an habitual dusky hue of the countenance. According to Stokes, these phenomena are most common when the lower lobes are chiefly affected.

The *physical signs*, however, are much more accurately diagnostic than the general symptoms. When the affection is severe, there is usually some dilatation of the chest, which is general or partial acccording to the extent of the emphysema. The thorax is more cylindrical than in health, being rounded somewhat both before and behind. The intercostal spaces are widened, though not bulging, the ribs have a more horizontal direction, and the hollow above and below the clavicle is apt to be filled up. Sometimes only one side is enlarged, and sometimes the bulging is quite partial. The heart, spleen, and liver are occasionally displaced as in empyema. If the movements of respiration are closely watched, it will be found that the chest falls little if any during expiration. Mr. Corfe gives, as a diagnostic sign of emphysema of the upper lobes, the appearance of a tumour in the triangular space between the clavicle, sterno-cleido-mastoid, and omohyoid muscles at each spell of hard coughing; a phenomenon ascribable to a sort of "hernia of the lung" from a want of support to the pleura at this place. (*Med. Times*, March 18, 1848.)

But these deviations from the normal shape of the chest are not always found. The surest signs are those afforded by percussion and auscultation combined. Under the former, the chest over the affected portion of lung emits an unusually clear and hollow sound, which is not, as in health, increased by a full inspiration; while, by the latter, the respiratory murmur can be heard but very feebly if at all. The expiratory sound is often much prolonged, probably owing to narrowing of the bronchia. The vocal parietal vibrations of the chest are generally diminished in emphysema; though the resonance is said to be sometimes natural, and sometimes augmented, even to bronchophony. Pneumothorax is the only affection which yields the same combination of signs; but, as this is generally attended with liquid effusion, the marks of such effusion are sufficiently diagnostic, especially when taken in connection with the very different origin of the two affections, and their very different course. In pneumothorax, moreover, there is a total want of the respiratory murmur, which can usually be heard, though feebly, in emphysema; while in the latter the metallic sounds are quite wanting.

The dry and moist rales of catarrh are often heard, and occasionally, according to Laennec, a dry subcrepitant rale, which, Dr. Gerhard says, is "nothing but the slight rustling sound produced by the bubbles of air, either forcing themselves into the areolar tissue, and forming little bags which rub against the pleura, or the dilated vesicles themselves, which are occasionally sufficiently rigid to give rise to some friction." (*Med. Examiner*, iii. 588.) Of course, in the purely vesicular emphysema, the sound can proceed only from the latter of these two causes.

Vesicular emphysema is almost always a chronic and very protracted affection. Beginning not unfrequently in childhood, it may run on to an advanced old age, and seldom proves fatal, unless through some concomitant affection. At first, the dyspnœa is usually slight, and the paroxysms at distant intervals. But, as life advances, the general difficulty of breathing increases, and the paroxysms become more frequent and distressing. Among the worst effects is the alteration in the position and state of the heart. By the expansion of the lungs, this organ is pressed downward, backward, and inward, so that, in the advanced stages, the cardiac impulse is often felt in the epigastrium, the space usually dull becomes clear under percussion, because occupied by the overlapping lung, and the point at which the heart's sounds are best heard is lowered. In consequence of the impediment opposed to the passage of blood through the lungs by the great diminution of the vesicular surface, the right side of the heart is apt to be affected with hypertrophy and dilatation, and hence a cachectic state of system, and dropsical effusion. It has been shown by Lebert and others that, in very old cases, the left ventricles also become hypertrophied; and Dr. Waters, of Liverpool, states that he has never seen a post-mortem examination of an inveterate case of emphysema in which both ventricles were not enlarged. (*Lancet*, Nov. 1864, p. 546.) At first sight, this would not be anticipated, as the diminished supply of blood through the pulmonary veins might be supposed to lead to a different result; but the difficulty vanishes when it is considered that the deficiency of blood in the capillaries causes a strong stimulus to be extended, through the cerebral centres, to the left ventricle, which being called into excessive action becomes of course hypertrophied. In the scanty supply of blood to the left ventricle, and the consequent excess of its action, we have, moreover, a satisfactory explanation of the smallness of the radial pulse, and yet strong cardiac impulse often found in old cases of emphysema. When certain parts of the lungs are affected and others sound, it is evident that a greater than the due portion of the respiratory office must fall upon the latter, so that they become especially liable to congestion and inflammation. It is probably by this affection that life most frequently terminates, in pulmonary emphysema.

According to Rilliet and Barthez, the physical signs of emphysema in children are different from those above given. The respiratory murmur, instead of being diminished, is remarkably exaggerated, the sound upon percussion remains about as in health, and the walls of the chest are not changed in form; so that it is not always easy to recognize the disease. They ascribe the louder murmur to the great efforts made by infants in breathing, the state of percussion to the naturally resonant character of the chest, and the want of alteration in the walls of the chest to the rapid march of the affection: But emphysema may always be suspected, in children affected with rachitis, or with an acute disease of the chest which has continued for some days, and occasioned violent respiratory efforts. (*Maladies des Enfants*, i. 138.)

The *extravesicular* variety differs somewhat in its course from the vesicular. Instead of being very chronic, it is generally induced suddenly by causes calculated to rupture the air-cells. When dyspnœa comes on all at once, after violent efforts at inspiration, it may be inferred to belong to this affection. The patient is sometimes sensible, under these circumstances, of a feeling of crackling. Laennec says that a characteristic sign always present is a dry subcrepitant rale, or, as he expresses it, a *dry crepitant rale with large bubbles*. It is much more constant and more marked in this than in the vesicular variety. He distinguishes this from the *friction sound*, which is also heard, and which is produced by the irregular surface of the lungs rubbing against the ribs, diaphragm, or mediastinum. Dr. Gerhard has probably given the true explanation of this phenomenon in the sentence already quoted. The vibration which produces the sound may sometimes be felt by the hand upon the chest. If, with the above signs, there is an appearance of emphysema about the anterior parts of the neck, there can be no doubt of the nature of the case.

This form of pulmonary emphysema is in general a comparatively trifling affection. It may, in some very rare instances, be so extensive as to occasion suffocation; but usually absorption of the effused air takes place, the ruptured orifices heal, and the patient recovers in a short time.

Causes.—Whatever produces and sustains severe dyspnœa, while from any cause portions of the tissue of the lungs have been rendered incapable of ordinary expansion, may prove the cause of pulmonary emphysema. The expanding power of the muscles of inspiration, thus abnormally and excessively exerted, is brought to bear not on the whole of the pulmonary tissue, as in health, but on the portion remaining expansible, which is, therefore, forcibly dilated beyond the normal extent, and, by a continued application of the cause, becomes permanently dilated, the vesicles being not unfrequently ruptured at the same time. In asthma, the deficiency to be supplied by the expansion of the air-vesicles results from the spasmodic contraction of all the bronchial tubes. Hence, the emphysema is apt to be general in that affection. So constant an attendant, indeed, is it upon spasmodic asthma, when of considerable duration, that some pathologists have been induced to consider the latter complaint as nothing more than emphysema. But the mere mechanical dilatation of the air-cells is wholly insufficient to account for the nervous phenomena of asthma, which is undoubtedly the original affection. Besides the disease just mentioned, bronchitis is a frequent cause of emphysema, particularly when it affects the smaller tubes, and is attended with a very viscid obstructive secretion. It then affords the two conditions mentioned, in a high degree, causing much dyspnœa, while, by obstructing the bronchia in certain parts, and thereby disabling the tissue supplied by them from expanding duly, or even producing collapse, it throws the whole office of expansion upon the remainder. Dr. Williams has ingeniously suggested, as an immediate cause, a want of longitudinal extensibility in the bronchia, consequent upon chronic bronchitis, the result of which is, that the vesicles necessarily dilate towards the surface of the lung, so that this may remain in contact with the expanding walls of the chest.

The idea has been suggested, that fatty or other degeneration of the vesicular tissue may be the remote cause of emphysema, by diminishing the resistance to expanding influences that bear upon the vesicles; and evidences of such degeneration have been occasionally observed in the tissue; but this has probably resulted from the nutritive changes necessarily connected with the altered structure. Dr. Waters, of Liverpool, while denying the agency of fatty degeneration, still maintains that there is an original, or as it were idiopathic morbid condition of the tissue, generating emphysema without the necessary interference of any other abnormal agency, basing his belief mainly on the absence of any obvious disease which could have caused it, upon the occasional hereditary character of the affection, and the favourable influence upon it of measures which have been found useful in other degenerative affections. (*B. and F. Medico-chir. Rev.*, Oct. 1862, p. 510.) But Dr. Waters appears to have overlooked or ignored the existence, as a distinct disease, of spasmodic asthma, which is probably the source of the cases to which he alludes.

Cardiac affections, pulmonary abscesses, partial induration, atrophy, concretions, and tumours of all kinds pressing upon the bronchia, and partially filling the cavity of the chest, may be ranked among the causes of the complaint. In a slight degree, therefore, it should attend tubercles in the lungs; and though, according to Louis, the disease is seldom complicated with phthisis, yet, from the more recent observations of M. Gallard, it would appear that more or less of an emphysematous condition of the pulmonary tissue is a constant and almost necessary result of tuberculous deposition. (*Archives Gén.*, Août, 1854, p. 200.) It follows, from what has been said, that pulmonary emphysema is usually a secondary affection, originating in dyspnœa, which it aggravates.

Violent efforts at expanding the chest, or which require that the chest should be kept long in the expanded state, are also capable, unaided, of producing emphysema, though it is more frequently the extravesicular than the vesicular variety which results. Playing upon wind instruments, lifting very heavy burdens or other violent straining, and the practice of diving and remaining long under water, may be mentioned as examples of this kind of cause. The extravesicular emphysema is very apt to occur in the course of the other variety, upon the superadded operation of such causes; and the two forms, therefore, not unfrequently coexist.

Treatment.—During the exacerbations of dyspnœa, the patient must be kept at rest, and all existing occasional causes removed as far as possible. Should evidence be presented of the existence of acute bronchial inflammation, or active pulmonary congestion, blood should be taken by the lancet, or from between the shoulders by cups, or both generally and locally, according to the state of the circulation, and the urgency of the symptoms; and small doses of tartar emetic may be given, at short intervals, so long as acute inflammation may continue. Afterwards, and originally in cases in which there have been no acute inflammatory symptoms, narcotics, antispasmodics, and local irritants are highly useful. Such are laudanum and Hoffmann's anodyne, with sinapisms to the breast or back. The smoke of stramonium may also be tried, if not contraindicated by cerebral symptoms; and the various remedies enumerated under spasmodic asthma may be resorted to if necessary. To promote expectoration, and relieve the bronchial spasm, few remedies will probably be found more efficacious than mixtures of equal parts of syrup of squill and seneka, with twice the quantity of tincture of lobelia. One or two teaspoonfuls of such a mixture may be given every hour or two, or even more frequently, unless it nauseate, until the symptoms are relieved. For a more permanent effect than can be obtained from sinapisms, recourse may be had to blisters or pustulation by tartar emetic, when the dyspnœa is protracted.

But the most important part of the treatment is that which is directed to the prevention of the paroxysms of dyspnœa. Towards directly relieving the habitual amount of it, little can be done; but there is reasonable ground to hope that, if the exacerbations can be prevented, the progress of the disease may be delayed or arrested, and that, especially in the young subject, the air-cells may in the end gradually contract, and a positive amelioration of the disease take place. The patient, therefore, should carefully avoid all the causes calculated to bring on dyspnœa. He should never use any great muscular exertion likely to put him out of breath; should never, for example, attempt to run, or rapidly ascend heights, or lift heavy burdens. He should guard with peculiar caution against taking cold; and should therefore clothe himself warmly with flannel next the skin, always keep his feet dry, and take care not to expose himself, when heated, to currents of cold air. Laennec recommends frictions with oil as a preventive of catarrh. Measures should be promptly taken to relieve attacks of inflammation in any part of the air passages. Residence in a warm and equable climate is highly desirable; and sea voyages in the warmer latitudes may prove beneficial. When the original cause of the dyspnœa continues to exist, and can be reached, the efforts of the physician should be especially directed towards it. Thus, in anemic cases, the chalybeates and other means of improving the condition of the blood should be used.

A new agency has been introduced by Prof. Bertin, of Montpellier, in France, in the treatment of emphysema of the lungs. It consists in the use of the compressed-air bath, by which, through the relatively small bulk of air required for the wants of respiration, the patient is spared those excessive efforts in breathing which are incessantly counteracting the natural tendencies of the cells to contract. M. Bertin assures us that radical cures are often effected, and may always be anticipated, when no irremediable cause of the disease continues to act. The whole number of cases observed by him was 105, of which 7 were in patients under 20 years of age, 41 between 21 and 40, and 57 above 40. Of these, about 80 were completely and durably cured; most of the others were in various degrees relieved; and only 3 resisted the treatment absolutely. (*Arch. Gén.*, Janv. 1861, p. 101.)

In the extravesicular form, little treatment is requisite. In cases of extreme and threatening dyspnœa, bleeding should be resorted to in order to lessen the duty of the lungs; and, if emphysema should appear about the neck, the air may be let out by punctures.

Article VI.

BRONCHIAL DILATATION.

This is not so much a disease in itself as an effect of disease. It is worthy of notice chiefly from the close resemblance of its signs, in some instances, to those of phthisis, and the consequent occasional difficulty of diagnosis.

The smaller tubes are more commonly affected than the larger, probably because they have less of the cartilaginous structure. The dilatation is in different forms. Sometimes the tube is equally enlarged, and of a nearly cylindrical form for a considerable distance; sometimes the dilatation is confined to one spot, and is somewhat spherical in shape; and again, there is a succession of dilatations and contractions in the same tube. In the first case, the bronchial passage may be dilated from the size of a fine straw to that of a crow-quill, or the finger of a glove. A number of the branches of one of the large bronchia are often affected, and sometimes the whole of those going to a particular part of the lung. The globular dilatations vary, to use the language of Laennec, from the size of a hempseed to that of a cherry-stone, almond, or even walnut.

These cavities often contain pus. Their coats are sometimes much and irregularly thickened, and exhibit little or nothing of the healthy structure. In other instances, they are so thinned by distension as to have the appearance of fine membrane. Frequently the pulmonary tissue without them is considerably compressed by their dilatation; and a compact layer of this compressed tissue forms a sort of exterior coating to the tube.

Symptoms.—There are no general symptoms by which this affection can be recognized with tolerable certainty. It is almost always accompanied with cough and expectoration, which, however, are the signs of an attendant chronic bronchitis, and not of the dilatation. The expectorated matter is often purulent, and sometimes fetid, possibly because detained and altered in the enlarged tubes. When the dilatation is considerable, it produces more or less dyspnœa, through compression of the lungs, and is sometimes attended by a pale or livid complexion, a general cachectic appearance, and dropsical effusion, arising from deficient aeration of the blood.

The *physical signs* are much more decisive. The hand applied to the chest is sensible of a more than healthy vibration from the voice and cough. Dulness on percussion often results in some degree from the compression of the tissue of the lungs. Sometimes percussion elicits a tubular sound, such as is produced by the same means over the trachea. The mucous and subcrepitant rales of bronchitis may usually be heard by auscultation. When the affection consists in a general enlargement of the tubes of a particular part of the lung, a diffused sound of bronchial respiration, and a bronchial resonance of the voice, are audible. When the dilatation is a rounded cavity, the respiration is cavernous; and, if liquid is present, there is a cavernous gurgling, and the voice issues from the wall of the chest in the form of bronchophony or pectoriloquy. These are the signs also of a tuberculous cavity; and there are no certain means of distinguishing the two affections, except by their general symptoms and course. (See *Phthisis.*) Some aid may be derived from the situation of the physical signs. Tuberculous vomicæ generally exist near the apex of the lungs; while dilatation is certainly not less frequent in the middle and lower than in the upper lobe. According to Skoda, the bronchial walls must be thickened, or surrounded by consolidated lung tissue, to yield the sounds above referred to.

Causes.—Two causes may produce bronchial dilatation. One of these is a disturbance of the equable distribution of atmospheric pressure, whereby it is concentrated in an especial manner upon some one portion of the bronchial surface; the other is a morbid alteration in the coats of the tubes, which, by impairing their elasticity and muscular contractility, disposes them to dilate under any pressure that may be applied to them. Both of these causes operate in chronic bronchitis. By the abundant mucus secreted, or by the thickening of the tubes, the access of air to some part of the lungs is diminished or prevented, and, as this part cannot expand fully with the dilatation of the chest, the deficiency must be supplied by the more than ordinary expansion of the neighbouring structure. Bronchitis, too, produces the altered state of the tubes themselves, which has been alluded to as favouring their dilatation. The violent cough which often attends the complaint increases the result, by augmenting the force of the expanding agency. Hence, chronic bronchitis and hooping-cough are the complaints in which bronchial dilatation is most frequent. Whatever is capable of producing similar obstruction may occasion the same result. Hence, pulmonary tumours pressing upon the bronchia, such as aneurisms, scirrhus, or enlarged bronchial glands, are among the causes of dilatation. It will be seen, hereafter, under cirrhosis of the lungs, that compression of the air-cells, by the formation of an abnormal fibroid tissue, occasionally gives rise to the affection. Dr. Williams has noticed another condition in which it sometimes originates. In pleuro-pneumonia, the air-cells of the lung, compressed by the pleural liquid, are sometimes unable to expand sufficiently to fill the vacuity caused by the absorption of the liquid, and the deficiency is supplied by the dilatation of the bronchia. Those of the middle size are usually most affected.

Treatment.—The mere dilatation of the bronchia requires no treatment. It cannot be relieved by medicines. Attention must be directed to the diseases in which the dilatation originated, and by which it continues to be accompanied. Of these the most frequent is chronic catarrh or bronchitis, to the remarks upon which the reader is referred for an account of the proper treatment. The chief practical point of interest, in connection with this subject, is the importance of not abandoning, as incurable, cases of pectoral disease presenting most of the general characters, as well as physical signs of phthisis, unless it should have been well ascertained that they are not chronic bronchitis, with dilated tubes.

Article VII.

PHTHISIS.

Syn.—*Pulmonary Consumption.—Tuberculous Consumption.—Phthisis Pulmonalis.*

As employed in this work, the term *phthisis* is restricted to that form of tuberculous disease, in which the lungs are the part prominently affected. Formerly, various other pulmonary diseases, bearing a close resemblance to that under consideration, were confounded with it under the same general name; but, anatomical investigations having shown an essential difference between them, and the comparatively recent improvements in the means of diagnosis, by the discovery of percussion and auscultation, having offered the means of detecting this difference during life, there is an obvious propriety in distinguishing them also by name; and most writers now recognize phthisis as the distinctive title of the tuberculous complaint. This disease is probably the greatest existing scourge of the human race, at least in the northern and middle latitudes. It will not be deviating far from the truth to state, that it causes about one-sixth or one-seventh of all the deaths north of the tropics.[*] In treating of phthisis, it will be proper to give first its anatomical characters; as a knowledge of these is requisite to a thorough understanding of all other parts of its history. In detailing these characters, I shall not confine myself to the appearances usually presented after death, but shall endeavour to trace the progress of organic change from the commencement to the close, as ascertained by the minute and indefatigable researches of pathological anatomists, in every stage and variety of the disease.[†]

Anatomical Characters.

Though there is reason to believe that the pulmonary affection is a consequence of a previously existing vice of the system, yet the first discoverable process, the first overt act of the disease, is the deposition of tuberculous matter in the lungs. This appears in different forms, and with different characters, being sometimes deposited in small roundish well-defined bodies denominated tubercles, sometimes irregularly infiltrated into the pulmonary tissue, and, in relation to its sensible properties, varying from a firm consistence, and grayish translucent appearance, to a yellowish opacity with or without hardness. Each of these modifications requires a more particular notice.

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[*] From a table contained in the report of Dr. J. Curtis, published in the *Transactions of the American Medical Association* (ii. 540), it appears that the deaths from phthisis in Boston, during the twenty-eight years from 1821 to 1848 inclusive, were 1 in 5·76, or 17·86 per cent. of all the deaths. Dr. Hayward, from an examination of the statistics of New York for thirty years, gives the proportion in that city as 1 in 5·547, or about 18·02 per cent. (*Am. Journ. of Med. Sci.*, N. S., xx. 312.) In Philadelphia, in the ten years from 1831 to 1840 inclusive, according to the tables of Dr. Emerson, the deaths were 1 in 7·08, or 14·16 per cent. (*Ibid.*, xvi. 28.) In the ten years preceding 1820, on the same authority, the proportion in Philadelphia was 1 in 6·38, or 15·67 per cent. (*Morton's Illustrations*, p. 167.) The mean of these will give for Philadelphia, during the period of twenty years, 1 in 6·705, or 14·91 per cent. To give the results in one view, the average mortality by consumption in Boston has been 1 in 5·76 of the whole number of deaths, or 17·86 per cent., in New York 1 in 5·547, or 18·02 per cent., in Philadelphia 1 in 6·705, or 14·91 per cent. From statements to be made in a subsequent note, it will appear that the mortality in Philadelphia, from this cause, though on the average very nearly the same in the decade following the year 1840, which is the latest date to which the above estimate extends, became afterwards considerably modified, under the influence of a special cause. (*Note to the third and sixth editions.*)

[†] For an interesting and valuable paper on the microscopic characters, origin, development, and progress of tubercles in the lungs, by Dr C. Radclyffe Hall, containing the results of an extensive series of original investigations, the reader is referred to the *British and Foreign Medico-chirurgical Review* for April and October, 1855, and April, 1856. There is in this paper a great amount of information on minute points, for which room can scarcely be found in a general treatise like the present, but which will amply repay the trouble of a careful perusal. (*Note to the fifth edition.*)

1. *Pulmonary Granulations.* — *Gray Granulations.* — *Miliary Tubercles.*—Under these various names have been described, by different authors, minute, roundish, shining, *translucent*, hard, homogeneous bodies, often not larger than a millet-seed, but varying from this size to that of a pea, which appear often in great numbers as the first step of phthisis. They are usually grayish, but sometimes have a light-reddish, and sometimes a dull dark-red or brownish colour; and occasionally are nearly colourless. They are either isolated, or clustered in small bunches, or in aggregate masses in which portions of the pulmonary tissue are enclosed and consolidated. In the last-mentioned state, they are almost always confined to the upper portion of the lungs; but, in the distinct or isolated condition, they are occasionally dispersed throughout the whole or a greater portion of these organs, giving rise to great pulmonary irritation. In children they are often situated immediately beneath the pleura, producing an irregularity perceptible to the fingers; and the same is sometimes the case in adults.

2. *Gray Tuberculous Infiltration.*—The same kind of matter which forms the granules above described, is often also deposited in the areolar tissue of the lungs, in irregular masses, sometimes one, two, or even three inches in cubic dimensions, without definite boundaries, or limited only by the extent of the lobules. This is the gray tuberculous infiltration of Laennec. It is homogeneous, hard, translucent, and of a grayish colour, sometimes darkened by the black matter of the lungs, portions of which become enveloped in the masses as they are formed. In some instances, no traces of pulmonary tissue can be detected by the unassisted eye in the masses; in others, they present remains of blood-vessels, bronchial tubes, and areolar tissue; and occasionally they are partially penetrated by the air in respiration.

3. *Gelatinous Infiltration.*—Under this name, Laennec described a colourless or rose-coloured substance, more transparent than the gray matter noticed in the last paragraph, and of a jelly-like consistence, which is sometimes deposited in small quantities in the tissue of the lungs, in the intervals of the tuberculous granules, and which he believed to be gradually converted into proper tuberculous matter. Louis states that he has met with this species of infiltration, but has not noticed in it the yellow tuberculous points spoken of as not uncommon by Laennec. Dr. Morton, in his *Illustrations of Pulmonary Consumption*, gives two cases in which the tuberculous transformation appeared to have commenced in this gelatinous matter. Dr. Hall states that its microscopic elements are the same as in the gray tubercle, but contained in a more abundant and softer matter.

4. *Crude Tubercle, and Yellow Tuberculous Infiltration.*—The gray translucent matter, constituting the first two deposits above noticed, appears to undergo a gradual conversion into what has usually been considered the proper tuberculous substance. In the miliary granulations, the transformation commences by a small yellowish white spot, which most commonly appears at or near the centre, and gradually enlarges until the whole granule assumes that character. In this altered state, the little bodies are denominated *crude tubercles.* In the aggregated granules, the change commences at several points, each probably answering to a distinct granule; and considerable masses of yellow opaque matter result from the extension and ultimate coalescence of these central spots. The same transformation takes place in the infiltrated translucent matter, beginning in like manner with isolated opaque spots, and spreading until it involves the whole deposit, which, when thus altered, receives the name appropriated to it by Laennec of *yellow tuberculous infil-*

tration. This may be distinguished from the crude tubercle by an irregular and angular, instead of roundish form, and by a less definite line of division between it and the pulmonary tissue.

There is no doubt that both the crude tubercle and yellow infiltration are often originally deposited in their characteristic state, without the preliminary formation of the translucent matter.

The minute bodies originally deposited in the state of crude tubercle, that is yellow and opaque, are also frequently called miliary tubercles, especially when found in other tissues than the lungs; and, in the general observations on tuberculosis in the first volume of this work, the name of miliary tubercle is applied as well to the opaque as to the translucent granules.

Progress of Tubercles.—The yellow tubercle, whether original, or the result of a transformation of the gray, gradually increases by new accretions. As observed upon dissection, it is frequently found, when quite mature, about as large as a pea; but it varies from the size of a large pin's head to that of a hen's egg, is irregularly roundish, and consists of a yellowish-white, opaque, friable substance, which easily breaks up between the fingers. In relation to its chemical composition, microscopic characters, and peculiar constitution, the reader is referred to the general remarks on tuberculosis, in the first part of this work. (See *vol.* i., *p.* 124.)

The next change in the tubercle is that of softening. This usually begins in or near the centre, and gradually advances towards the circumference, until the whole tubercle is converted into a soft, pultaceous, yellowish mass, not unlike pus in appearance. According to Dr. Hall, softening sometimes begins at the circumference when this is in contact with inflamed tissue. The same alteration takes place in the infiltrated masses. In some instances, instead of this gradual change, the whole tuberculous deposit, whether circumscribed or not, appears to be simultaneously softened; and large portions of the lungs may be thus rapidly converted into pultaceous matter. According to Rilliet and Barthez, the softening of tubercles is comparatively rare in infants; and gradually becomes more frequent, as the child becomes older.

At this stage, the irritating properties of the confined matter produce inflammation of the adjacent parts, which at length ends in ulceration, and thus opens a communication between the tubercle and the bronchial tubes. The matter now escapes, and is expectorated, leaving a cavity which is technically called a vomica. The cavities thus formed are sometimes lined, more or less completely, by a secreting membrane formed out of fibrinous exudation, and are sometimes as it were hollowed out of the substance of the lung, without any intervening tissue. When recent, this membrane is delicate and easily separable; when old, it is firm, translucent, grayish, and sometimes of an almost cartilaginous consistence. The surrounding parenchyma is sometimes healthy; but much more frequently is altered, and often greatly so, being crowded with tubercles, or with tuberculous infiltration, or both, in various stages of advancement. The cavities are sometimes isolated and remain so; but not unfrequently they gradually spread by the breaking down of the surrounding tissue, and thus run together, forming caverns of various dimensions, and of very irregular shape, occasionally winding, and now and then crossed by bands of solid tissue, composed generally of the tuberculated substance of the lung, but sometimes of altered bloodvessels remaining in a certain degree pervious. Dr. Morton traced in some instances, by means of a delicate probe, a [illegible] branches of the pulmonary artery or [illegible]. The tuberculous cavity may not be larger than a pea, or [illegible] and there is every grade between these extremes. [illegible] progress of the tuberculous deposit open [illegible] their [illegible] mucous membrane is often continuous. The tubes show signs of inflammation in their increased thickness, and the redness and occasional ulceration of the mucous coat.

The contents of the cavities, after the evacuation of the altered tuberculous matter, consist of pus secreted by the lining membrane or the surrounding tissue, with which are occasionally mixed small quantities of blood, tuberculous matter from the falling in of the walls, and portions of disorganized pulmonary tissue. They are usually inodorous, but sometimes fetid. The proper blood-vessels of the lungs are generally obliterated in the immediate vicinity of the cavity; and the new tissue formed around it is nourished by new vessels, derived either from the bronchial arteries, or, when the lung adheres to the side of the chest, from the intercostals. Cavities are much less commonly produced in children than in adults.

By the progress of the changes above described, the lung is at length so far destroyed as to be no longer adequate to the performance of its office, and the patient perishes. But the march towards this result is by no means steady or constant. In many instances, clear evidence is afforded by dissection of attempts, not always fruitless, to repair the mischief which has been done. When the tissue around the cavity is healthy, its lining membrane sometimes ceases to secrete; the walls contract, and the opposite surfaces, coming in contact, unite together, and are consolidated into a fibro-cartilaginous body, which is quite harmless in the lungs. Such cicatrices have been repeatedly observed in parts of the lungs where tuberculous vomicæ are most apt to form. They are rare, it is true, but there can be no doubt of their occasional existence, and little of their tuberculous origin. In such cases, a cure must result, if the morbid deposition has been confined to this one spot. Another mode in which the tubercle may terminate favourably, is by conversion into calcareous matter. This may happen by the absorption of the organic portion of the tubercle, the earthy or saline constituents being left; and repeated depositions, followed by similar absorption, may finally result in the filling of the cavity with the earthy substance. Now such concretions, of size varying from that of a hempseed to that of a chestnut, are not unfrequently found in the lungs, especially of old persons, though not of these exclusively. They are sometimes soft like chalk, sometimes much harder; but in both cases consist of the same ingredients, which are chiefly carbonate and phosphate of lime; the same essentially as the inorganic constituents of tuberculous matter. The difference in consistence appears to be owing to the effect of age, in producing a firmer aggregation. The inference from these facts is fair, that the calcareous concretions are altered tubercles; and that some of them are so, can scarcely be doubted; for tubercles have been found with portions of calcareous matter in the midst of their ordinary contents, showing a commencement of the process. According to M. Valleix, tubercles are sometimes seen consisting of hard calcareous matter in the centre, next of a softer layer of the same substance, and lastly of unchanged yellow matter at the circumference. (*Dict. de Méd.*, xxiv. 327.) This would seem to show that a change had begun in the centre, and was gradually proceeding outward. Nevertheless, it is possible to err in referring these concretions always to a change of tubercles; for they may sometimes be simply calcareous deposits in distended bronchial tubes.

The views here given of the origin and progress of tubercles are not universally admitted. They are, however, such as, upon a careful examination of the subject, have appeared to the author to approach nearest the truth. They correspond essentially with the opinions of Laennec and Louis, and with those of M. Valleix, as contained in an excellent essay upon the anatomical lesions of phthisis, in the *Archives Générales* (3e sér., x. 133 et 279).

There are yet several interesting questions in relation to the anatomical history of tubercles. In the first place, in what precise portion of the pulmonary tissue are they deposited? Various opinions have been put forth upon this point. Thus, they have been supposed to be enlarged absorbent glands; but this opinion is supported by no fact, while it is contradicted by the absence of all signs of organization, and by the utter want of any proof of the existence of such glands in many situations where the tubercles are found. Another opinion considers them as the result of exudation into the air-cells, to which they are thought to owe their shape. But they are found of the same shape in other organs, where no such cells exist. Finally, they have been placed in the radicles of the veins, in the mucous membrane or cavity of the bronchial tubes, and in the intervesicular tissue. The fact, however, appears to be, that they are confined to no particular position; but are found wherever there are blood-vessels to throw out the materials of which they are composed, whether in the vesicles, the minute bronchia, the areolar tissue between the air-cells, or that between the lobules.

A second point of inquiry is in relation to their origin. Many persons, and of these some whose names stand among the highest in pathology, have maintained that they are the result of an inflammatory process. But, though it is readily admitted that inflammation sometimes precedes the tuberculous deposition, and may even favour or give rise to it when a predisposition exists, yet there are many cases in which not a trace of it can be detected, either at the origin or in the early stage of the tubercle; and, when it occurs, there is good reason to consider it as the consequence, and not the cause of that morbid product. An argument against the inflammatory origin of tubercle is deduced from the fact, that it is least frequently found in those parts of the lungs where inflammation is most frequent; the former almost always preferably occupying the upper, the latter most commonly the lower portion. Laennec and Louis have been among the most strenuous opponents of the inflammatory hypothesis; and the general opinion of the profession is at present against it.

The mode of softening in tubercles has been another subject of controversy. Many have maintained that this is effected by the infiltration of purulent or serous fluid secreted by the tissue which invests the tubercles, and which is stimulated by its presence into an inflammatory condition. Broussais, Andral, and Carswell have been, among others, the supporters of this hypothesis. But there is one difficulty in the way of its reception, which cannot well be surmounted. The softening commences at or near the centre of the tubercle, or at least at some point within its substance. Though there may be some exceptions, the fact is, beyond all reasonable doubt, generally as stated. To this effect we have the concurrent testimony of the closest observers, among whom may be cited Starck, Baillie, Laennec, and Louis. The last-mentioned writer, who is perhaps the highest authority upon the subject, speaks unequivocally upon this point. Now, as the tubercle has no blood-vessels penetrating through its substance to the point of softening, it appears impossible that this should result from the influence of any secreted liquid. The change is probably altogether spontaneous. The tuberculous matter appears to be exuded with the character of change impressed upon it. When deposited originally in the form of gray translucent granules or masses, it first becomes yellow and opaque, and then softens into a pus-like substance. Each alteration commences in the centre, because that was the seat of the first deposition, and the time of change for any portion of the matter must obviously be in the order of its production. We may go even beyond the softening, and suppose that, in relation to each tubercle, when the softened matter fails to make its way out of the cavity containing it, nature may have provided another remedy, by rendering it liable to a last change, which may end in the separation of its earthy and saline ingredients, and such a modification of the animal matter as to enable it to be absorbed. Thus the chalky concretions may be accounted for. In relation to the nature of tubercle, it appears to me on the whole most probable that, as thrown out from the blood-vessels, it is a formless matter, possessing a feeble vitality, which enables it to take on a partial organization, characterized by peculiar imperfect cells, and ending, after various changes, in complete disintegration.* (See *Tuberculosis*, vol. i. *page* 126.)

The first seat of the tuberculous deposition is, in the great majority of cases, in the upper part or near the summit of the lung; and when, as not unfrequently happens, it occurs in other parts, the tubercles are almost always more abundant, larger, and more advanced, in the situation alluded to, than elsewhere; and it is here also that vomicæ form. Large cavities are generally nearer the posterior than the anterior surface. The tubercles seem to evince a preference of the upper over the lower lobe, even at the same level. Thus, the former may be completely occupied with the morbid deposit, while the latter is nearly or quite free from it. When the tubercles are widely diffused, they usually begin to appear above, and extend gradually downward; and of course the upper are more advanced than the lower. Gray miliary tubercles are sometimes scattered through the whole of the lungs; but, in such cases, the patient is apt to perish before they have advanced to the crude state. In those rare instances in which the middle and lower portions of the lung are first affected, the deposition is apt to be in the form of yellow and opaque tubercle at the commencement.†

In almost all cases, there is more or less of the tuberculous deposition in both lungs, sometimes in about an equal degree, but much more frequently in one to a greater extent than in the other. Sometimes the tubercles are confined exclusively to one lung. According to the observations of Louis, the left lung is more frequently affected than the right; and this appears to be the general experience, though Laennec has made a contrary statement.

Sometimes the tubercles are few and isolated; and the surrounding pulmonary structure may be quite healthy. But much more frequently they are numerous; and, if the disease is of long standing, they are found in different stages, showing a deposition at successive periods; those in the upper portion of the lung being most advanced, and the others appearing less and less so as they descend. Occasionally something like a boundary line, though never quite precise, may be observed between the successive crops. Thus, in the same lung, tubercles may often be found in all their different stages. It not unfrequently happens that large portions of the lungs are consolidated by a mixture of tubercles and tuberculous infiltration, and, when cut into, present a mottled appearance, arising from the different colours of the deposit in its different stages, and of the portions of pulmonary tissue which remain. Sometimes the whole of one lung is thus solidified. In the midst of this consolidation are frequently isolated or communicating cavities, which gradually increase by the falling in of the disorganized structure, until at length vast caverns are sometimes formed; and almost the whole lung may thus become excavated, or otherwise rendered unfit for duty.

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* This opinion, however, does not conform with that of Virchow and his disciples, who maintain that tubercle-corpuscles originate in the perversion of young connective tissue-cells; nor with that of Schroeder Van der Kolk, who believes he has demonstrated that they are nothing else than an aggregation of the epithelial cells of the pulmonary vesicles, which by imbibition of plastic matter effused into the cavity, swell up, enlarge, and are cast off from the walls of the vesicle. (*Dub. Hosp. Gaz.*, March 15, 1858, p. 87.)—*Note to the sixth edition.*

† In the examination of a negro who died of phthisis in the winter of 1856–7, I was struck with the fact that the upper part of the lungs was entirely free from tubercle, which had been deposited copiously at the base, and here and there through the lower and middle portions. Dr. J. J. Levick, one of my colleagues in the Pennsylvania Hospital, informs me that he has met with a similar case, also in a negro; and I have learned that others have made the same observation. These facts are yet too limited to justify the conclusion that negroes are peculiarly apt to offer exceptions to the general rule that tubercles are deposited primarily and especially near the apex of the lungs; but they are interesting, and, if confirmed, may form an important ground of diagnosis in the pectoral complaints of this class of patients. (*Note to the fifth edition.*)

Very often, and, when the disease is extensive, almost always, the pleura of the lung is found adhering to that of the side. Of 112 cases examined by Louis, there was only one in which no adhesion could be found in either lung. Generally it is limited to that portion of the surface which corresponds with the tuberculous affection; but in some instances it is very extensive, and may be even universal. The adhesion is the result of inflammation of the pleura, and the consequent exudation of organizable lymph, and is found in different stages, from the mere cohesion of the recently deposited fibrin, to the perfect union by intervening areolar tissue. It often answers an admirable purpose, by preventing the effusion of the contents of the tuberculous cavities into the pleural cavity. Sometimes, however, such effusion does take place, and general inflammation of the pleura results, which adds greatly to the danger. Should a communication, in such cases, exist also between the vomicæ and the bronchia, air enters the pleural cavity, and pneumothorax results.

The bronchia are always more or less inflamed in the advanced stages of phthisis, especially those which communicate with the tuberculous cavities. Occasionally, numerous minute ulcers may be seen in their mucous surface. These, however, are more frequent in the trachea, especially in its posterior part. They are found also not unfrequently in the larynx, and upon the posterior surface of the epiglottis. Occasionally the bronchial tubes are dilated, and partial emphysema of the lungs is very common. The bronchial glands are frequently enlarged, indurated, and loaded with yellow tuberculous deposition. In very many cases, the pulmonary tissue is more or less inflamed, but generally in isolated patches. Hepatization of large and continuous portions of the lungs is not common, and, when it occurs, arises generally from incidental causes, unconnected, at least directly, with the tubercles.

Appearances in other parts of the body.—As tubercles in the lungs are the result of a general predisposition, it might be expected that they would be found in other organs; and this is very frequently the case. It is a singular fact, that, without the lungs, the deposition seldom takes place in the form of translucent granules, but almost always in that of the yellow and opaque tubercle. Nevertheless, the translucent granulations, the opinion of Andral to the contrary notwithstanding, have been seen by many observers in different parts of the body. (*Archives Gén.*, 3e *sér.*, x. 136.) I have myself seen them in countless multitudes in the liver of a patient who died of phthisis. The extrapulmonary tubercles are generally consecutive to those in the lungs, but by no means universally so; and the exceptions are not unfrequent in children. They have been observed in the pleura and its false membranes, the pericardium, the peritoneum, the stomach and intestines, the mesenteric glands, the liver, spleen, and kidneys, the prostate gland and testicles, the membranes and substance of the brain, the external lymphatic glands, and even in the bones. Indeed, there seems to be scarcely a living part of the body which is not liable, in a greater or less degree, to this deposition. In relation to their relative frequency in different organs, Louis found that, of all the cases of phthisis in persons over the age of fifteen, one-third presented tubercles in the small intestines, one-fourth in the mesenteric glands, one-ninth in the large intestines, one-tenth in the cervical glands, one-twelfth in the lumbar glands, one-fourteenth in the spleen, and a smaller proportion in other organs.

In the great majority of cases, the stomach exhibits after death signs of organic disease. It is usually larger and thinner than in health, and the mucous membrane has all the marks of chronic inflammation, including sometimes ulceration. It is probable, however, that the loss of tissue, consequent on the solution, after death, of the mucous membrane in the gastric juice, has sometimes been mistaken for the result of ulceration. Similar marks of inflammation also exist in the small intestines; but the lesions here are more frequently of a peculiar character. Small tuberculous granules are developed in the substance of the intestinal coats, in the glands of Peyer, as well as elsewhere, which undergo the regular process of softening and discharge, and terminate in ulcers. These are small when isolated, but, by running together, frequently acquire considerable dimensions, sometimes occupying the whole inner circumference of the intestine. I have noticed that the greater length of these patches of ulceration is rather in the direction of the circumference of the bowel, than longitudinal as in enteric or typhoid fever. They are most numerous in the vicinity of the cæcum. Other little tumours, not of the tuberculous character, are also often visible in the mucous membrane of the small intestines. They are of a semi-cartilaginous consistence, and are thought by Louis to be inflamed mucous glands. Like the tubercles, they end in ulceration. Occasionally, the ulcers penetrate the coats of the intestines, and allow their contents to escape into the peritoneal cavity. Ulcers are also not unfrequent in the large intestines, and sometimes of enormous extent. The mesenteric glands are often enlarged and inflamed, from the deposition of tuberculous matter within them. The liver is subject to a singular fatty degeneration, with great enlargement. In children, the membranes of the brain are frequently tuberculated, with all the phenomena of hydrocephalus. (See *Tuberculous Meningitis.*) From observations by Dr. Theophilus Thompson, it appears that the average weight of the heart is above that of health, a result which might have been anticipated from the excessive action of this organ. (*Clin. Lect. on Pul. Consump.*, Am. ed., p. 89.) Various other lesions are frequently observed in the dissection of consumptive cases; but they are generally such as equally attend other affections, and have no peculiar dependence either on the tubercles or the tuberculous diathesis.

Symptoms, Course, &c.

Two stages may be observed in the course of phthisis, corresponding with the two stages in the progress of the tubercles, one preceding and the other following the period of their maturation and discharge. These are not always separated by a precise line of division; and it is often difficult to decide, in particular cases, where exactly the first ends and the second begins. But each stage is sufficiently characterized, in its prominent symptoms, at periods when the pathological condition peculiar to it is quite unmixed.

First Stage.—Phthisis begins in different modes. Most frequently, perhaps, the first symptom is a short, dry, hacking cough, very slight at the commencement, so as often scarcely to attract any notice, but gradually increasing, and, after a longer or shorter time, attended with expectoration, first of transparent mucus, and afterwards of a white or yellowish opaque matter, as in common catarrh. For some time there is little other observable derangement of system. The appetite is good, most of the functions are regularly performed, and the patient is scarcely sensible of any diminution of strength. Perhaps, upon the occasion of any unusual exertion, there may be some shortness of breath, and a more than ordinary feeling of fatigue. The pulse, too, is often accelerated, especially during exercise; and, as the complaint advances, the patient begins to experience febrile sensations towards evening, with some flushing of the cheeks, and heat in the palms of the hands and soles of the feet. Occasionally fugitive pains are felt between the shoulders, in the sides, or about the sternum. But probably the most characteristic symptom is a slight but progressive emaciation, which cannot be ascribed to any discoverable failure of the appetite or digestive powers, and seems out of proportion to any existing evidence of disease. This, however, is not a uniform attendant upon the incubative stage. Indeed, the symptoms altogether are frequently such as occur in other complaints, especially dyspepsia; and it is not uncommon for patients with the latter affection to entertain serious apprehensions of phthisis, while those really consumptive have no such fears. In the condition above described, the patient may continue for weeks or months, and sometimes even for years. His cough he ascribes to an obstinate cold, or to frequently taking cold; his pains, if he has any, to rheumatism; and he either shuts his eyes against the other symptoms, or explains them in some satisfactory manner. At length, however, the increase of cough and fever, the occurrence of severe pain, or perhaps, still more frequently, an attack of hemorrhage from the lungs, excites alarm. Sometimes the hemorrhage, which usually subsides spontaneously, or readily yields to remedies, is followed by an amelioration of the cough, fever, and pains, and the patient feels himself much better, and even believes himself recovering. In other instances, it appears to mark an aggravation of the disease, the progress of which is afterward much more rapid. Not unfrequently the hæmoptysis returns again and again; and, in some cases, the patient is seldom long without the discharge of blood from the lungs. But, whether hemorrhage occurs or not, the symptoms continue to advance, sometimes regularly, but more frequently with remissions, which are occasionally of considerable duration, and always a source of hope and comfort to the patient. The cough at length becomes very troublesome, often disturbing sleep, and sometimes occurring in violent paroxysms. The expectoration takes on a more decidedly purulent character. The dyspnœa and thoracic pains often increase, and the febrile symptoms are more decided, the pulse being almost always frequent, the face often flushed, the tongue somewhat furred, and the appetite impaired. In some instances, the fever exhibits a tendency to the paroxysmal form, and the patient not unfrequently perspires during sleep. The first stage is now at its height, and, having continued in this state a variable length of time, passes sometimes abruptly, sometimes by imperceptible degrees, into the second.

Occasionally, instead of beginning and gradually increasing as above described, the disease, with no observable premonitory symptoms, or at least with none that attract notice, comes on suddenly with an attack of hæmoptysis, after the subsidence of which the characteristic phenomena are developed, slowly or rapidly, according to the susceptibilities of the patient.

Again, the disease originates apparently in an inflammatory affection of the respiratory organs, as bronchitis, pneumonia, or pleurisy, or follows closely in the footsteps of some febrile disease, as small-pox, scarlatina, typhoid fever, or bilious fever. In these cases, after the subsidence of the peculiar symptoms of the disease, the pulse remains obstinately frequent; cough, if previously wanting, sets in, or, if already existing, perseveres beyond the usual period; and the other characteristic phenomena of early phthisis show themselves, for the most part, with unwonted severity. Sometimes a catarrhal affection glides so imperceptibly into phthisis, that it is impossible to decide which was the original disease, unless the catarrh may have commenced suddenly in sound health, and with unequivocal symptoms, as in influenza and measles.

Another mode in which phthisis occasionally commences is with the symptoms of chronic laryngitis, which prevail for some time before those of the pectoral affection are developed, and often serve to mask the latter until the complaint is far advanced.

Lastly, cases occasionally though rarely occur, in which the disease comes on so insidiously as altogether to escape notice, until it breaks forth fully formed, and with the most fatal symptoms. In such cases, there is little or no cough, no pain, and no observable febrile excitement. Perhaps the patient may experience some dyspnœa upon any unusual exertion, may feel rather weaker than in his ordinary health, and may gradually become thinner; but these effects, if they happen at all, are so slight as scarcely to attract notice, and, if perceived, are referred to some other cause. At length, some symptom calculated to excite suspicion occurs, which leads to a physical exploration, and unequivocal signs of extensive disease are found in the upper part of the chest; or the vomica which has been imperceptibly forming opens into the bronchia, and the symptoms of the second stage are at once developed.

Second Stage.—This often comes on so gradually that the precise time of its commencement cannot be fixed. There is not unfrequently an increase of fever preceding the opening of the vomica, consequent probably upon the inflammation excited by the matter of the tubercle, seeking an outlet through this means. The patient, previously walking about, now takes to his bed, and suffers with pains in the chest, heat, thirst, loss of appetite, furred tongue, &c.; till at length the character of the expectoration proves that an outlet has been made; after which there may for a time be a subsidence of the febrile symptoms. But, in many instances, the second stage sets in gradually without any such premonition; and occasionally bursts at once upon the patient almost without previous warning. The most characteristic symptom of this stage is the peculiar appearance of the expectoration, which is now decidedly purulent, and generally in distinct well defined masses, with an occasional accompaniment of softened tubercle, in the shape of small lumps of yellowish cheesy matter. These, however, often escape notice. The cough is now generally increased, and is especially troublesome in the morning, when the accumulations of the night are to be discharged from the lungs. The fever assumes a decidedly hectic character. The pulse, almost always frequent, becomes considerably more so at some period of the twenty-four hours, generally towards evening; and this exacerbation is accompanied with increased heat of the skin, flush of the face often circumscribed upon the cheek, and a remarkable clearness of the conjunctiva and general brilliancy of the eye. The febrile paroxysm often subsides with a gentle perspiration. Not unfrequently, chills occur at somewhat regular periods every day, followed by fever and perspiration, like the paroxysms of intermittent, but less regular, usually less violent, and with much less pain in the head. These chills do not occur in all cases, and are frequently interrupted, to return again, often without any appreciable cause for either change. The patient very frequently perspires during sleep, and, in the progress of the complaint, the night-sweats become profuse and exhausting. They are not necessarily connected with the febrile paroxysms; but continue when these are suspended, and are sometimes very abundant, even in those rare cases in which the pulse is little excited. Sharp pains in the sides and posterior parts of the chest are frequently experienced, which are sometimes neuralgic, but oftener probably the result of pleurisy, which is a very common accompaniment of phthisis. In the latter case, the pains are generally attended with some increase of fever, which subsides again upon their removal. Hemorrhage from the lungs now and then takes place, but not in all cases, and less frequently and copiously than in the first stage. The purulent expectoration is generally very copious; and this, with the exhausting night-sweats, and constant irritation of system, hastens the progress of debility and emaciation.

The ends of the finger nails often curve forward, giving a peculiar appearance to the fingers, which has been thought to be characteristic of phthisis, but is found, though less frequently, in other chronic and exhausting diseases, especially when accompanied with imperfect oxidation of the blood. The name of *clubbed finger* is given to this deformity, which was noticed as early as the times of Hippocrates. The incurvation of the nail is accompanied with a thickening of the end of the finger, and generally an increase of its breadth.

The menses are almost always suppressed in the course of the complaint, though at uncertain periods. The appetite is often greatly impaired, if not lost. All these symptoms, however, are occasionally relieved, or quite disappear for a time. The discharge of pus lessens and at length ceases; the cough and fever subside; the appetite returns; and the patient even begins to recover flesh. The vomica has been emptied, and has probably begun to take on the healing process; but a new crop of tubercles is deposited, and the delusive calm is generally succeeded by a return of the original symptoms, often more violent than at first. At an advanced period of this stage, the stomach and bowels often become involved in the disease. The patient suffers from frequent attacks of diarrhœa, which are sometimes exhausting. They occasionally alternate with the night-sweats; but not unfrequently the two discharges are simultaneous. Nausea and vomiting are occasionally added to the other sufferings of the patient; and, in some instances, food of all kinds is rejected by the stomach. Hoarseness and total loss of voice are not uncommon, and the dyspnœa sometimes becomes very distressing.

In some instances, the patient is suddenly carried off by the supervention of some secondary affection, such as active congestion of the only portion of lung remaining fit for duty, copious pleuritic effusion on the same side, pneumothorax, profuse hemorrhage from the lungs, severe peritoneal inflammation consequent upon perforation of the bowels, the bursting of a large vomica overwhelming the lungs, and disease of the brain produced by tuberculous deposition in that organ or its membranes. This last cause of death, however, is almost peculiar to children.

Generally, the fatal termination approaches more gradually. Among the symptoms now presented, in one or another case, are œdema of the extremities, especially of the feet and legs; redness of the tongue, with the loss of its papillary appearance, and a thrush-like exudation upon its surface; a total loss of appetite, with vomiting and diarrhœa, the latter sometimes approaching to dysentery; severe dyspnœa; extreme emaciation; and complete prostration of strength. The adipose matter is almost wholly absorbed, the muscles are wasted, the cheeks are hollow, the eyes sunken, and the bones everywhere prominent, unless concealed by œdema. Not unfrequently the back sloughs, in consequence of pressure upon the bony prominences. Until near the close, the debility is sometimes less than might be anticipated; the patient being frequently able to sit up much of the time until a few days before death. But at last the weakness becomes so great that expectoration is impossible; the cough ceases; pus accumulates in the lungs; and life ends, because respiration cannot be carried on. The intellect generally remains clear to the last.

Dr. Theophilus Thompson has called attention to the frequent existence, in consumptive patients, of a reddish streak or margin at the reflected edge of the gums, having in decided cases a vermilion tint, inclining to lake, and sometimes more than a line in breadth. It is present in the earliest as well as in the advanced stages, and, when seen in women, may, according to Dr. Thompson, be considered as almost conclusive evidence of the existence of a tuberculous state of system. Its absence is a favourable sign. (*Clin. Lect. on Pul. Consump.*, Am. ed., pp. 171 and 184.) This symptom, however, is found in other diseases, particularly in those in which the blood is disordered, and frequently occurs in pregnant and puerperal women, in whom no pathological lesion can be discovered. (Drs. Saunders and Draper, *N. York Journ. of Med.*, Jan. 1857, p. 64.)

Dr. C. Radcliffe Hall has noticed an audible pulsation of the breath escaping from the mouth in two cases of phthisis, and ascribes it to the impulse of the heart upon a large empty cavity, with firm walls, rather dry, and not separated from that organ by permeable lung-tissue. (*B. & F. Medico-chir. Rev.*, July, 1863, p. 72.)

But the disease is liable to great diversities, and there is scarcely a symptom which does not vary in different cases. Complications also exist which require notice. It is, therefore, necessary to add to the above general picture some account of individual symptoms, and of different attendant or intercurrent diseases. I shall endeavour to avoid the repetition of facts already stated, so far as may be consistent with clearness.

Cough and Expectoration.—Cough is generally the most prominent and distressing symptom, though sometimes wanting until near the close. In the early stage, it is probably the result of bronchial irritation, produced by the increasing tubercles, which act like so many foreign bodies in the lungs. It has been described as generally trifling at the commencement; but, in some instances, it is from the first severe, occurring in irregular and distressing paroxysms, owing probably to some ill-defined nervous irritation. It generally increases with the advance of the disease, and in the second stage becomes very harassing, so as sometimes almost to prevent sleep, and thus greatly to aggravate the complaint. The cause of this increase is partly the necessity for discharging the contents of the vomicæ, but probably still more the bronchial inflammation, induced by the contact of the irritating tuberculous matter with the mucous membrane in its passage. The expectoration, which, until this time, had been purely bronchial, now assumes a peculiar character. It is in distinct, somewhat globular sputa, of a thick semi-fluid consistence, homogeneous, destitute of air, of a yellowish or greenish-yellow colour, often streaked with deeper yellow lines, and generally somewhat ragged or flocculent at the borders. When discharged into water, they flatten out without quickly losing their distinct character, and either sink or float as they happen to be more or less connected with mucus. From a supposed resemblance, under these circumstances, to a piece of money, they are often called *nummular*. Along with these sputa are occasionally minute portions of curdy matter.* Besides this kind of expectoration, the patient often also discharges a large quantity of more liquid purulent or muco-purulent matter, proceeding chiefly from the inflamed bronchia. The nummular sputa come from the cavities, and are among the most certain general symptoms of phthisis. Sometimes, though very rarely, they are met with in other complaints of the chest. They consist of pus, and the liquefied tuberculous matter, which, according to Louis, is indicated by the yellow streaks. The quantity of matter expectorated varies exceedingly in different cases. In some very copious and even exhausting, in others it is scanty, and in others again scarcely observable. In the last-mentioned cases there is reason to suppose that the bronchia are little involved.

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* According to Schroeder Van der Kolk, of Utrecht, the existence of a cavity in the lungs may be infallibly detected by the aid of the microscope, which reveals in the expectorated matter the presence of the elastic fibres which surround the air-vesicles. These fibres are curved, very thin, sharp at the borders, and sometimes covered with fatty matter, which is dissolved by ether. They are distinguishable from a species of conferva which soon appears in the sputa, by the ramifications of the latter terminating in cells. (*Rev. Med.-chirurg*, viii. 222.)—*Note to the third edition.*

Dr. C. Radclyffe Hall gives, as characteristic microscopic ingredients of the expectoration in *impending tuberculization* of the lung, "single plates, or small flakes of flat epithelium from the air-vesicles, fattily degenerating, and bronchial columnar epithelium, also presenting various degrees of fatty degeneration:" considering this change of the epithelium of the vesicles and small tubes as the first step in the process of forming tubercle. In *incipient tuberculization*, besides these ingredients of the sputum, there are also "red globules more or less shrivelled and faded, enveloped in a filmy cell, a few large many-nucleated cells, granules, and frequently small casts of the air-vesicles and ultimate bronchi, in which are plainly visible epithelial cells of various sizes, and in various stages of fatty degeneration." In *established phthisis*, there are largely mixed with the last-mentioned bodies, "corpuscles of mucus and pus, and free tubercle-nuclei (the proper tubercle cell) occasionally in small quantity." (*B. and F. Med.-chir. Rev.*, Am. ed., April, 1855, p. 379.)—*Note to the fifth edition.*

I have known a case in which the whole amount during the progress of the disease, so far as could be ascertained, scarcely exceeded the dimensions of the vast cavity which was found in the lungs after death. Sometimes the distinct sputa are quite wanting; the expectoration being exactly like that of chronic bronchitis in the purulent stage. This is apt to happen when there are large caverns in the lungs. Occasionally the pus in this stage of phthisis is streaked with blood. In some instances, after having been copiously discharged, it gradually diminishes, and at length ceases, at least for a time. There is then reason to suppose that the cavity has taken on a healthy action, and to hope that it may in time become obliterated. Very commonly, however, other tubercles maturate, and the discharge is renewed. In the last period of the disease, the pus is sometimes of a reddish or brownish appearance; and portions of the pulmonary structure and of unchanged tubercle have been observed in it, derived from the falling in of the walls of the caverns during their enlargement. The cough in advanced phthisis often has a deep hollow sound, which has long attracted notice as one of the fatal signs of the disease. Both the expectoration and cough are apt to cease a few days before death, in consequence partly of the muscular debility of the patient, which renders him unable to use the necessary efforts, partly, in all probability, of that insensibility which creeps over the system, and prevents any impression upon the sensorium by the matter which may exist, or be accumulating in the lungs.

Dyspnœa.—This is a much less prominent symptom in phthisis than might be supposed. Very often in the early stage, and not unfrequently in the second till within a short period before death, the patient is scarcely sensible of any difficulty of breathing; and it is not uncommon for persons in this complaint to expand their chest to its full limits, in order to show how free they are from disease of the lungs. This frequent exemption from dyspnœa is probably owing, in the first stage, to the very gradual progress of the tuberculous encroachment, which enables the system to accommodate the quantity of blood produced to the capacity of the lungs; and, in the second, when the encroachment is more rapid, to the colliquative sweats and diarrhœa, which, while they exhaust the strength, have the compensatory effect of duly proportioning the circulating fluid to the diminished extent of the respiratory function. The feeling of dyspnœa, being generally owing to an insufficient change of the blood in the lungs from venous to arterial, is not experienced when all the blood which the system requires passes through these organs, and undergoes the requisite alteration in its passage. But when the patient uses unwonted exertion, he becomes more or less short of breath, because the lungs are inadequate to the due aeration and transmission of the increased quantity of blood sent to them in a given time, in consequence of the heart's increased action. Sometimes, however, severe dyspnœa is experienced in phthisis, especially towards the close. This is peculiarly liable to happen when the disease is complicated with pleuritic effusion, or pneumothorax. I have known a patient to maintain steadily, for one week before death, a sitting posture, leaning forward with his head resting upon the hands of his nurses, because extreme dyspnœa rendered any other position insupportable. In the cases of diffused miliary tubercles, which sometimes rapidly deteriorate the powers of respiration, and produce speedy death, dyspnœa may be throughout the disease a somewhat prominent symptom.

Pains.—Pains in the chest are not usually among the most striking phenomena in consumption. In many cases they are slight, and in some are almost wholly wanting throughout the complaint. There are, however, instances in which they are frequent and severe; and, in the majority of cases, the patient is subject to sharp fugitive pains, attacking various parts of his chest, sometimes ascribable to inflammation of the pleura, sometimes merely neuralgic. Occasionally, neuralgic pains are felt also in the back and limbs.

Hemorrhage.—This is one of the most prominent features of phthisis. Sometimes, as before stated, it appears to usher in the disease; but more frequently occurs in the course of it. Even in the latter case, however, it is apt to be regarded by the patient as the initial symptom, because the cough which may have preceded it has scarcely been noticed. In some instances, the hemorrhage is copious; but, in a greater number, is slight, and in itself insignificant. It almost always yields speedily to remedies, or subsides spontaneously. In some cases there is only one attack, in others the attacks are frequent; and they are more apt to occur in the first than in the second stage of the disease. The obstruction of a portion of the lungs necessarily produces congestion in other parts, which is probably the immediate cause of the hemorrhage in most instances. In the latter period of the disease, this congestion is relieved by the copious purulent secretion, not to mention the night-sweats and diarrhœa; and the hemorrhagic predisposition is thus diminished. Those rare instances in which a sudden and copious hemorrhage overwhelms the lungs, in advanced phthisis, are usually ascribed, and probably with justice, to the opening of a large vessel in the course of the pulmonary disorganization.

Though a frequent symptom, there are many cases in which hæmoptysis does not occur from the commencement to the end, unless so far as merely to stain the sputa. Out of 87 cases noticed by Louis, it was observed in 57. It is among the most certain diagnostic symptoms of phthisis. When a patient, with a chronic cough and emaciation, spits blood copiously, he may be regarded as almost certainly tuberculous. Louis goes much further than this, and states that, since his attention had been directed to the subject, he had seen hæmoptysis in no other affection than phthisis, except in females attacked suddenly with amenorrhœa, and in cases of external violence. (*Dict. de Méd.*, xxiv. 344.) The same author, in his great work on phthisis, expresses the opinion, that, with the exception just named, hæmoptysis indicates, "in a manner infinitely probable, whatever may be the period of its appearance, the presence of tubercles in the lungs." (*Recherches*, p. 194.) But I am convinced that this most accurate observer has, in this instance, permitted himself to draw an incorrect general inference from his personal observations. I presume that every practitioner of large experience, in this country, has known many instances of spontaneous hemorrhage from the lungs, in male subjects, from which the patients have perfectly recovered, without, through the subsequent course of their lives, evincing any signs of phthisis. Such cases have repeatedly fallen under my own observation; and there are men to be seen daily in our streets, in good apparent health, whom I know to have suffered with hæmoptysis at various periods from ten to forty years since. It is hardly probable that all these cases are examples of the cure of phthisis. Besides, what is there in the structure or position of the bronchial mucous membrane, which should exempt it from an affection so common in other mucous membranes? I have insisted more than I otherwise should have done on this point, because I believe that the impression of the almost certainly fatal significancy of hemorrhage from the lungs, is calculated to do much harm, by alarming patients, and discouraging their medical advisers. The affection is more frequent in women than in men, and is very rare in children.

Frequent Pulse.—Fever.—Night-sweats.—Next to the cough, there is probably no symptom more constant than a frequent pulse. An obstinate continuance of these two symptoms alone should always be regarded with great solicitude, unless they have some other obvious cause than tubercles. The frequency of pulse often begins early, and continues steadily until the close of the disease. It is usually increased in the second stage, when it not uncommonly amounts to 120, and sometimes to 130, or even more, in a minute. In some cases, however, the pulse is unaffected as to its frequency through the whole course of the disease. It is in general very much accelerated by exertion. In the early stage, there is often, as before stated, a slight irritative fever, with flushed face and heat of hands and feet, coming on especially towards evening. The source of this affection is not by any means always obvious. It occurs sometimes when no inflammatory action can be shown to exist in the lungs, and cannot, therefore, be certainly ascribed to the direct irritation of the tubercles upon the neighbouring pulmonary tissue. It is not improbable that a strong tuberculous diathesis may be capable of generating a moderate febrile movement, in which case, this affection may be a mere accompaniment, and not a result of the tubercles. Nevertheless, whatever may be its origin, it is certainly often much aggravated by the inflammation produced by the tuberculous deposit, acting as foreign matter in the lungs. As the disease advances, the fever gradually assumes a hectic character, with a tendency to the paroxysmal form, and to perspiration at night. This often occurs before the commencement of the second stage, perhaps under the influence of the pus secreted by the bronchia, or that which may be contained in the tuberculous cavities yet unopened. But it is not until the cavities communicate externally, that the hectic fever, as a general rule, becomes decided. The night-sweats are often very distressing, giving rise to so much discomfort and exhaustion upon the awaking of the patient, that he dreads going to sleep. They appear to depend on debility of the capillaries, which allows the watery portions of the blood to pass without resistance; and they occur during sleep, because then the vital forces, and among them contractility, are at their lowest ebb.

Emaciation.—Debility.—Emaciation without apparent cause, in a patient having any other evidences of consumption, is an alarming symptom. Should the appetite fail, or any obvious disorder of digestion or source of exhaustion exist, sufficient to account for the loss of flesh, this in itself need occasion little solicitude. It is when apparently independent, that it becomes important as a sign. We know that some vice of system must be sapping its foundation; and experience has taught us that the existence of tubercles, or perhaps even a strong tuberculous diathesis, is one of the most common of these depravities. Occasionally, in the course of phthisis, the patient gains flesh during the remissions of the disease. This is a most favourable sign; and, if it persevere, even under other circumstances much less favourable, we have good grounds for the cheering impression, either that the disease is not really tuberculous, or that it is undergoing amelioration. The debility is in general scarcely proportionate to the loss of flesh. It not unfrequently happens that the patient is not confined to his bed one day, until near the close of the disease; and he is often able to walk out almost to the last. It is generally when associated with disease of the stomach and bowels that the debility is greatest.

Laryngeal Symptoms.—These may precede the signs of tubercles in the lungs, but much more frequently they come on during the disease, and often not until it has advanced considerably in the second stage. At first, there is some hoarseness, with perhaps a sense of dryness or huskiness of throat, or some pain in the larynx; and the affection may stop at this point. But not unfrequently, what was at first only inflammation becomes at length ulceration of the larynx, and this in its progress gives rise to loss of voice, difficulty of deglutition, the return of drinks by the nostrils upon attempts to swallow, and a most harassing and sometimes convulsive cough. The affection hastens the fatal issue, and sometimes proves an immediate cause of death through suffocation. (See *Chronic Laryngitis.*)

Stomachic and Intestinal Symptoms.—Little upon this point is required in addition to what has been stated. In the first stage, the appetite is generally little impaired, though cases now and then occur in which the symptoms of dyspepsia or chronic gastritis appear to precede those of the tuberculous affection, and have given origin to the name of *dyspeptic consumption*, which has sometimes been applied to the disease in this form. The complication is probably merely accidental, at least in most instances. It is not, however, impossible, that the debility arising from deranged digestion may aggravate a previously existing tuberculous diathesis into a more speedy explosion in the lungs. It has been observed that, when chronic gastritis with occasional diarrhœa attends the early progress of phthisis, its march is more rapid than under ordinary circumstances. Except as attendants upon the symptomatic fevers that occasionally occur in the course of phthisis, it is not usually until the second stage, and even a somewhat advanced period of that stage, that severe gastric symptoms appear. Loss of appetite, heat, pain or oppression at the epigastrium, with nausea and vomiting, are now experienced. The vomiting is occasionally very obstinate, so that every article of food or medicine is rejected. These symptoms are usually the result of chronic gastritis, the signs of which are very often found after death. The gastritis appears to be a consequence of the unceasing fever, rather than the direct result of a deposition of tubercles in the mucous membrane. Sometimes obstinate vomiting occurs, without leaving behind it, in the dead subject, any marks of inflammation whatever. Diarrhœa also is in general a symptom of the advanced stages. It shows itself in every form, mild and severe, scanty and copious, with and without abdominal pains, sometimes approaching to dysentery, sometimes accompanied with hemorrhage from the bowels, and not unfrequently indicating, by the character of the stools, a perverted or deficient action of the liver. Unlike the stomachic symptoms, it seems to be generally dependent upon tubercles in the bowels, which, by their softening and discharge, give rise to ulcers and inflammation. That the inflammation is the result and not the cause of the tubercles, is proved by the fact, that the latter are frequently found unattended with the former, in their early stage. The diarrhœa, after having been fully established, is seldom permanently cured. It may be arrested by medicine for a time, but usually returns, and often hastens the fatal result.

Nervous Symptoms.—There is generally a remarkable exemption from nervous disorder, when the duration and severity of the disease are considered. The cerebral functions are very little disturbed, and the intellect usually remains unclouded until the close, or near it, unless the membranes of the brain become involved in the tuberculous disease. When there is no disease of the stomach or liver, the patient almost always evinces a cheerful and hopeful frame of mind. He either believes that he will recover, or is calmly resigned to the fatal issue. The powers of self-deception in this complaint, when the patient is unwilling to admit the idea of death, are truly wonderful. In the last stage, lying upon his bed, exhausted, breathless, and scarcely able to speak, he assures his medical attendant that he is better, and will soon be about again. Even physicians, perfectly acquainted as they are with the nature of the disease and the value of the symptoms, are scarcely less apt than others to deceive themselves as to the probable issue.

Sexual Symptoms.—In male patients, nothing remarkable occurs in connection with the sexual functions. It is otherwise with women. Suppression of the menses is very common, and may generally be considered as increasing the danger. The occurrence of pregnancy undoubtedly, in many instances, arrests for a time the progress of the disease; and lactation appears to exercise a favourable influence over it.* Alarming symptoms often disappear during gestation; and it sometimes happens, in young married women, that the disease is kept at bay many years by child-bearing and nursing; occasionally, indeed, so long that the predisposition appears to be overcome. In most instances, however, it returns after delivery, and sometimes appears to compensate for the lost time by a more rapid march.

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* Some observations have been made which tend to throw doubt over this long admitted fact of the influence of gestation in retarding phthisis. But, independently of the general belief, my own personal observation has been such as to render it impossible for me to have any doubt upon the subject. I have repeatedly seen the disease, even in its somewhat advanced stages, apparently quite arrested on the occurrence of pregnancy. Two

Complications.—The laryngeal and gastro-enteric affections already described, being either the direct-result of the same diathesis which produces the pulmonary tubercles, or a secondary effect arising from the tubercles themselves, must be considered rather as parts of the disease than as complications. The same may be said of the bronchial inflammation, arising from the irritation of the tubercles or ot the tuberculous matter in its passage, which is the source of most of the matter expectorated in phthisis, and is scarcely ever quite wanting in the course of the disease. The partial inflammation of the pulmonary tissue, in the vicinity of the tuberculous deposit, may be placed in the same category; as may also the pleurisy which results directly from the irritation of the tubercles near the surface of the lungs, or from the escape of the contents of a tuberculous vomica into the pleural cavity. (See *Pneumothorax.*) Tuberculous meningitis, which occasionally accompanies phthisis, though very rarely in adults, belongs to the same category. For the symptoms of this affection the reader is referred to the article specially devoted to it. There is always reason to suspect it, when vomiting, headache, and delirium occur.

But accidental attacks of all these affections now and then supervene upon phthisis, arising from cold, epidemic influence, or other ordinary cause. In such cases, they are properly complications, and often add greatly to the immediate danger, and hasten the fatal result. They differ in various respects from the analogous inflammation constituting a part of phthisis. Thus, they may occur at any period of the complaint; and, if they do not prove fatal, very generally disappear spontaneously, or yield to remedies, though frequently more obstinate than the same diseases under other circumstances. Their precise seat, also, is not always exactly the same. Thus, accidental bronchitis may attack any portion of the lungs, while that essentially belonging to phthisis is confined to the bronchia connected with the tuberculated structure. Accidental pneumonia occupies usually the lower lobes, instead of being limited to the neighbourhood of the morbid deposit. Accidental pleurisy may affect any part or the whole of either membrane, even that of the sound side, and is much more apt to be attended with liquid extravasation than the real phthisical affection. An increase of fever generally attends these phlegmasiæ, and the existence of one of them may be suspected, when a consumptive patient is suddenly seized with chill, followed by fever, not of a hectic character.*

There are diseases between which and phthisis a certain degree of incompatibility is thought to exist. Thus, consumptive patients are little disposed to attacks of acute rheumatism; and to this circumstance it is ascribed by Dr. T. K. Chambers that, of a large number of cases of pericarditis examined in St. George's Hospital, London, a very small portion relatively was associated with

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cases are prominent in my recollection. The patients were admitted into the Pennsylvania Hospital, with cavities in their lungs, and all the symptoms of decided phthisis. After a time they began to improve wonderfully and unaccountably. The general symptoms vanished almost entirely, and they became fat and healthy in appearance. This change was found to be coincident with the occurrence of pregnancy. They left the institution before delivery, and I have not seen them since. (*Note to the third edition.*)

* Dr. W. R. Hill, of Edinburgh, records the following complications, with the frequency of their occurrence, in 220 cases of phthisis;

1. Pneumothorax	6	4. Tuberculous meningitis	3	7. Albuminuria	3
2. Laryngeal disease	17	5. Tuberculous peritonitis	2	8. Diseased bones	3
3. Fistula in ano	5	6. Tuberculous intestines	5	9. Supra-renal capsules	1

(*B. & F. Medico-chir. Rev.*, Jan. 1862.)—*Note to the sixth edition.*

tubercles of the lungs. (*Med. Times and Gaz.*, v. 455.) Rokitansky teaches that cyanosis affords a complete protection against tuberculosis, and that whatever produces a similar venous condition of the blood has more or less of the same protective effect. Though this is, perhaps, generally true, it is not so universally; for a case is on record in which the two affections existed conjointly. (*Assoc. Med. Journ.*, March 10, 1854, p. 222.) Few habitual drunkards are attacked with phthisis; and the exemption may possibly be owing to a somewhat similar carbonaceous condition of the blood. It has been supposed that miasmatic fevers afford some protection against tuberculous disease; but proof is yet wanted of the truth of this conjecture. There can be little doubt, however, that, as a certain condition of the blood favours the development of tubercles, so there may be diseases which may have a contrary effect, by their influence upon that fluid.

Physical Signs.—In the earliest stages these are very equivocal. When the deposition is considerable, some dulness may be perceived in percussion under the clavicle, and upon that bone. This sign is more significant, if the dulness upon one side is decidedly greater than on the other, and especially if greatest upon the left side. A similar inequality of sound upon the two sides exists in emphysema and pneumothorax, the diseased side being, in these cases, more sonorous than the other; and there may be some danger that the diseased side may be considered healthy, and the sound side tuberculous. But the mistake may be avoided by recollecting that, in these affections, the respiration is feebler where percussion is most sonorous, than where least so. If the dulness be very slight, some advantage may be derived from the fact that the increase of clearness on percussion, during a full inspiration, is greater on the sound than on the affected side. An emphysematous condition, in the vicinity of the tubercles, may render this sign nugatory by compensating for the partial solidification, so that the percussion may not materially vary from that of health.

Among the first deviations from health discovered by auscultation, is feebleness of the respiratory murmur below the clavicle. While this is observed in one part, another may yield a more than usually loud sound, in consequence of being compelled to perform a greater amount of duty. As the consolidation advances, the respiration becomes somewhat rough, or even bronchial, with a considerable prolongation of the expiratory sound, which is one of the most striking characteristics of this stage of tuberculous deposition. At the same time, the inspiration is sometimes interrupted, wavy, or jerking. The sounds of the heart are more distinctly audible in the part. The vocal resonance, and that of the cough, are also increased; but it must be remembered that, near the sternum, both bronchophony and bronchial respiration are heard in health; so that, in order to be of any weight as signs of tubercle, they must be found towards the humeral extremity of the clavicle. Allowance must also be made for the natural difference of the two sides, in respect to these sounds. (See *vol. i. p.* 887.) It is said, that the greater extension of healthy bronchial respiration, more or less pure, on the right side than the left, is most observable in females. Hence, in relation to these, special care must be taken not to mistake the normal for an abnormal state. Another physical sign is the increased vibratory motion from the voice, felt by the hand applied to the subclavicular space. All these signs may also, in general, be perceived, though in a less degree, over the upper portion of the scapula, behind. They indicate solidification, more or less complete, of the pulmonary tissue; and, when this takes place under the clavicle, without the ordinary evidences of acute pneumonia, the probability is very strong that it is owing to tubercles. When the lung in the vicinity of the arch of the aorta is solidified by tubercles, a murmur coincident with the first sound of the heart is sometimes heard, probably caused by pressure on the vessel. Over the heart itself, the sounds are healthy. The pulmonary artery and the subclavian may yield similar sounds under a similar pressure from tubercles, the former in the second intercostal space to the left of the sternum, the latter beneath the clavicle.

In a more advanced state of the deposition, the mucous and subcrepitant rales, and occasionally also the sonorous and sibilant rales, make themselves heard in the same position. These are the sounds of catarrh; but this, occurring as an original disease, commonly affects other regions of the lungs. Percussion is still more dull than before, and the vibrations produced by the cough and voice still more perceptible by the hand. Very frequently too the upper part of the chest is obviously contracted or sunken, and there is less movement of the ribs in respiration. This sinking is probably owing in part to atrophy and shrinking of the pulmonary tissue, partly to the formation of false membrane between the pleural surfaces, and the contraction which it undergoes in the process of organization. Another sign consequent upon the formation of false membrane is the friction sound, which may sometimes be heard for a short time; but it is so fugitive as usually to escape notice. I have repeatedly observed also a creaking sound, which I have ascribed to the flexion of organized false membrane consolidating the opposite pleural surfaces. In general, the progress of the formation of a cavity can be followed with considerable accuracy. At first, a loose crackling sound will be heard during inspiration, at a point where induration exists; the bubbles become more numerous, larger, and somewhat more diffused, and are audible both in inspiration and expiration; and finally all the signs of a cavity are perceptible.

After the vomicæ have opened, and begun to discharge their contents, percussion usually remains dull, the increased vibratory movement of the wall of the chest with speaking and coughing continues, and the contraction of the subclavicular space, and its comparative want of motion are still observable. But the characteristic sounds of cavities are now perceived; as the cavernous rale or gurgling when the cavity is partly filled with liquid, cavernous respiration and resonance of the voice and cough, and at length pectoriloquy. Skoda denies that these signs can be certainly relied on, as all of them, even pectoriloquy, may arise from a condensed lung without a cavity. Yet, when they are all perceived, there can be little doubt upon the point, especially when their indications are in accordance with those of the general symptoms. When the cavity is very large, the vibrations produced by the voice immediately over it are diminished, but they are increased at the margin where the lung is solidified. Frequently, in large cavities, the respiration becomes amphoric, the voice acquires an amphoric resonance, and the sound denominated metallic tinkling may be heard. This is particularly the case when the walls of the cavity are very firm, approaching the consistence of cartilage. These are unfailing signs. When other means fail, the existence of a cavity may sometimes be detected by a sound of fluctuation produced by coughing, or a slighter sound of the same nature occasioned by the impulse of the heart on the contained liquid. It has been stated that percussion usually continues dull in this stage. It is so occasionally for a very considerable extent. But, in some cases where the cavity is very large, and near the surface, it yields a hollow *tubular* or *somewhat tympanitic sound*, such as is produced by performing percussion over the trachea, or an *amphoric sound* like that which results from striking the distended cheek, or finally, the *bruit de pot fêlé* of Laennec, or *cracked-metal sound*,* which is compared by Dr. Walshe to that occasioned when the hands, loosely folded, are struck against the knee so as to allow air to be forced out from between them. In relation to the indications afforded by percussion, it must be remembered also that the tissue, not occupied by the tubercles, but in their immediate vicinity, not unfrequently becomes more or less emphysematous, and consequently increases the resonance upon percussion. This is sometimes so great as to overbalance the pulmonary solidification. Even the increased respiratory duty performed by these unaffected parts, in consequence of the want of action in the consolidated portion may occasion greater resonance on percussion, through the larger amount of air admitted, independently of emphysema. It is obvious that all these circumstances must be considered, in forming an estimate of the value of percussion signs in the diagnosis of tubercles. Sometimes all the auscultatory signs of a cavity fail, even though the general symptoms may indicate its existence, and post-mortem examination prove it. There may be feeble respiration, or other modification of the normal sounds; but there is no cavernous respiration, no pectoriloquy, no amphoric resonance or gurgling. M. Woillez explains these cases on the basis of a diminution of the normal air-space of the lungs, in consequence of the increased volume of the lung-tissue, whereby the air is not admitted sufficiently to cause the characteristic sounds. (See *note, vol.* i. p. 894.)

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* This sound, which was supposed by Laennec to indicate the presence of air and fluid in a pulmonary excavation, may, according to Walshe, be produced without the presence of fluid, all that is necessary being a large anfractuous cavity, communicating freely by several openings with the bronchia. The cause of the sound is probably the vibrations produced in the sides of the bronchia, as the air is driven into them from the cavity by percussion over it. A proof of this is that if, during percussion, the mouth and nostrils

Hutchinson's spirometer may sometimes be advantageously resorted to, in order to ascertain the rate of progress of the disease. (See *vol.* i. *page* 896.)*

Course, Duration, &c.—Upon these points it is necessary to add something to the general description already given, in order to present a complete view of the disease. The duration of phthisis is exceedingly variable. While some cases run their course to a fatal termination in less than a month, others have been known to continue thirty or forty years. The greater number of cases probably terminate in from one to two years. When the disease is very rapid, it is sometimes named *acute phthisis*, or vulgarly *galloping consumption.* Its whole duration is only one, two, or three months; and sometimes death occurs in the third week. It is associated with different pathological conditions of the lungs. In one variety, miliary tubercles are diffused, in countless numbers, through the pulmonary tissue; and the diffusion is pretty uniform, except that there may be a somewhat greater accumulation towards the summit of the lung. These tubercles in general do not advance even to the yellow or crude state before death. Sometimes they may be attended with infiltration of gray matter, which also remains, throughout, in its first stage. There may occasionally be some softening of the tubercles in the upper part of the chest, and possibly a few small cavities in the more protracted cases. The attack in these cases is usually sudden, and the disease quickly acquires great violence. The symptoms, almost from the outset, are dyspnœa, severe cough, occasional pains in

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be firmly closed, the sound is not emitted, because resistance is offered to the entrance of air into the passages. Dr. R. C. Golding observed this peculiar sound to be produced by percussion over a circumscribed sub-pleural emphysema, in the upper part of the lung, the air from which was driven by the blow into the surrounding cellular tissue, and returned on its cessation. (*Lond. Med. Gaz.*, July, 1848, p. 83)—*Note to the second edition.*

* *Dimensions of the Chest in Phthisis.* On this subject, M. Henri Gintrac, of Bordeaux, has been making investigations, the results of which he communicated to the French *Academy of Medicine*, at its session of Sept. 23, 1862. The following are the conclusions at which he arrived. 1. The circumference of the chest is less than in health. 2. This diminution, which is appreciable from the commencement, goes on increasing with the progress of the malady; and may reach at the second period, 10 centimetres (8·9 inches) in the upper circumference, 8 for the mammary, and 6 for the lower. 3. With very few exceptions, the upper circumference is at all periods of the disease greater than the middle and lower. 4. The space between the two nipples in men represents exactly the dimensions of the thorax, being one-quarter of the mammary circumference. It measures, in the adult, on the average, 20 centimetres (7·8 inches) in health, 19 early in the disease, and 17 in the second stage. 5. The measurement of this space should form an element in the diagnosis of the disease. (*Arch. Gén.*, *5e sér.*, xx. 617.)—*Note to the sixth edition.*

the chest, great frequency of pulse and respiration, a hot skin, headache, loss of appetite, and other marks of considerable fever. The expectoration is not generally copious, and is exclusively bronchial; never exhibiting the peculiar purulent sputa of ordinary phthisis. Occasionally there is hemorrhage. As the disease advances, the symptoms acquire greater intensity, though sometimes a remission is observable, even in their short course. Towards the last, the pulse and respiration become exceedingly frequent, night-sweats occur, and the patient rapidly emaciates, though not to the same degree as in the more chronic forms. The ordinary physical signs of phthisis are often wanting. There may be no peculiar dulness under the clavicle, no signs of extensive consolidation anywhere, and none of the marks of a cavity The clearness upon percussion may be somewhat diminished here and there; and the respiration may be feeble in some points, and puerile, rude, or somewhat bronchial in others. The sibilant, sonorous, mucous, and subcrepitant rales of bronchial inflammation are heard in various parts of the chest. The steady perseverance of mucous or submucous rales, in the same parts of the chest, and over large portions of it, quite unaltered by treatment, indicating the permanent presence of some irritating agent, has been among the signs upon which I have most relied in the diagnosis of this form of phthisis. That the disease is not pleurisy or pneumonia will be inferred from the want of the characteristic signs of these affections. Bronchitis exists, but the onward course of the disease, the greater frequency of pulse and respiration, the occasional presence of hæmoptysis, and the occurrence of night-sweats without purulent expectoration, evince that there is something more, and this can be phthisis only. Death, in these cases, appears to arise from the interference of the tubercles with the functions of the lungs, and the exhaustion of system from the wearing effect of the local irritation.

Another variety of acute phthisis, presenting almost the same symptoms, and equally wanting the peculiar purulent expectoration of the ordinary disease, is connected with a rapid and copious deposition of tuberculous matter, so as to produce almost complete consolidation of a large portion of the lungs, or perhaps of one whole lung, and thus destroy life before the tubercles have had time to reach the second stage. Portions of the tuberculous deposition may in these cases be yellow and opaque, and even softened; but they have formed little communication with the bronchia. In such cases, the peculiar physical signs of the first stage of phthisis are observable in a marked degree.

A third variety of the acute disease is that which runs through all the stages with great rapidity. In these, the whole train of symptoms characterizing the last stage of ordinary phthisis, including the peculiar sputa, comes on in the course of a few weeks; and physical examination evinces beyond doubt the existence of vomicæ, sometimes of considerable size. Such cases sometimes follow an attack of copious hæmoptysis, or supervene upon inflammatory affections of the lungs, and febrile diseases of various kinds.

Ordinary phthisis, even when of considerable duration, is sometimes regular in its march, beginning in the usual insidious manner, and steadily advancing, with little or no remission, to its fatal close. But much more frequently it undergoes temporary interruptions; and, in many instances, the occasional signs of amendment are so considerable that both the patient and his friends indulge strong hopes of a favourable issue. The general and local symptoms abate, the appetite and digestion improve, and the patient gains strength and flesh. These changes occur both in the first and second stages, and, in some cases, several times in the course of the disease. Occasionally they may be traced to some known cause. Thus, the occurrence of pregnancy, as before stated, may partially or entirely supersede the symptoms of phthisis, even though advanced into the second stage; and the same favourable influence is in some degree exerted by lactation. An external direction, also, of the scrofulous disease appears to divert the tendency to tuberculous deposition from the lungs. This was strongly insisted on by the late Dr. Jos. Parrish, of Philadelphia, as one of the results of his extensive observation. I recollect well two instances of the disease in women of middle age, in which the symptoms of phthisis rapidly followed the disappearance of a long-continued scrofulous swelling of the neck, and appeared to have been kept back by the external affection. The influence of fistula in ano, and of old ulcers in the leg, in restraining the progress of phthisis, must be familiar to the experience of most practitioners, who have seen much of the disease. Not unfrequently, also, the amendment occurs simultaneously with the return of mild weather, which not only appears to exercise a directly favourable influence over the tuberculous diathesis, but is indirectly useful by favouring exercise in the open air. Some consumptive patients appear to regain in the summer what they lose in winter, and run on for many years, sometimes even to the end of a long life, never entirely free from tuberculous disease in the lungs, and yet enjoying much comfort in existence. I was for many years in the habit of attending a gentleman with this disease, who died at the age of seventy, and had suffered with cough, dyspnœa, and occasional attacks of hemorrhage from the lungs, from an early period of life. These alternations in the symptoms of phthisis are explained by the fact, that the tubercles are often deposited, not continuously, but in successive crops. Those first deposited advance to maturity, are discharged through the bronchia, and leave cavities which have a tendency towards health. Should the predisposition not be strong, and nothing occur to call it speedily into action, no new deposition may take place until the first crop has ceased to exert any unfavourable influence on the system, and the patient apparently recovers his health. Indeed, there is every reason to believe that permanent recoveries occasionally take place in this way. But much more frequently a fresh deposition occurs before the disappearance of the symptoms, or soon afterwards; and thus the disease only remits, or returns after having seemed to cease. Still more frequently, the amendment has had time to make little headway, before the new crop is sown, and then the remission is but slight. In other cases, again, either the original deposit is sufficient to destroy life in its course towards maturation, or the progress of deposition is so constant as to sustain a nearly regular advance in the symptoms, until the lung becomes unfit for duty. Cases sometimes occur, in which the most cheering signs of amendment appear, so far as regards the general symptoms; while to physical exploration the lungs yield evidence, not only of undiminished disease, but of a continual progress of disorganization. In these cases, the favourable symptoms are altogether deceptive. No case can be considered as having undergone a real amendment or cure, unless the physical signs coincide with the general symptoms.

Sometimes phthisis is latent so far as regards the ordinary signs of its existence, and continues so until a short period before the end. The tuberculous deposition takes place slowly, so as not to excite sensible irritation in the surrounding tissue, which, therefore, undergoes the necessary absorption or condensation, without any of those external expressions which constitute the early symptoms of the disease. Accumulation may thus gradually go on, and the tuberculous matter pass through all the regular changes, until one or more large collections are formed. These now make themselves felt by the inflammation necessary to effect their discharge; and, when the communication with the bronchia is opened, the irritating influence of the pus superadds bronchitis; and all the symptoms of the last stage are speedily developed. But another cause of the occasional latency of phthisis is, that tubercles, after deposition and a certain degree of advance, cease to make further progress, becoming, as it were, indolent, and sometimes remaining so for years. There is, indeed, reason to believe that, in such cases, they sometimes undergo absorption, and leave only calcareous matter in the place of the tuberculous.

Nature and Causes.

Phthisis does not consist merely in the deposition of tubercles in the lungs, and its consequences. There is, besides, a morbid state of system which precedes and attends the deposition, and upon which it probably depends. This state of system is commonly denominated the tuberculous diathesis or predisposition. It is either identical with the scrofulous diathesis, or closely analogous to it, and has been sufficiently treated of, in a general way, in the section upon general pathology. In the present place, it is considered only in its relation to pulmonary tubercles. What is the exact nature of this diathesis is unknown. It may consist essentially in a certain laxity of the tissues, which leads to weakness or perversion of function, so that, instead of well elaborated material for the purposes of nutrition, there is separated from the blood a peculiar product, of the lowest grade of vital force, with the tendency to degeneration fixed upon it, which exists as foreign matter in the midst of the living structure. Or it may be the blood itself that is in fault. The only defect, however, which has been shown to exist in it, is a want of the due proportion of red corpuscles, and this defect has not been proved to be essential. It goes on increasing with the advance of the disease (*Andral and Gavarret*), and may, in this state of things, be as much the result as the cause of tubercles in the lungs. The fibrin of the blood is sometimes redundant in the course of the complaint; but this appears to be owing to the inflammatory affections which so often attend it. But whether the blood is in any degree essentially perverted or not, this much may be considered as certain, in relation to the tuberculous diathesis, that it is accompanied with a reduction of the vital forces below the healthy standard, or, in other words, is a condition of debility. What else there may be cannot be told in the present state of our knowledge; though, that there is something besides mere debility, is sufficiently obvious from the consideration, that an equal degree of this condition often exists without any production of tubercle, or any apparent tendency towards it.

The causes of phthisis are either those which create this morbid state of system, or those which call it into action, when it might otherwise remain quiescent. These will be separately considered under the heads of predisposing and exciting causes.

1. *Predisposing Causes.*—Decidedly the most influential of these, so far as known, is inheritance. Phthisis is pre-eminently a hereditary disease. One parent very often entails it upon the offspring, and both still more frequently. Whole families thus descended are not unfrequently swept away by this fearful malady. Even where the immediate descendants of consumptive parents escape its developed form, they nevertheless often retain the predisposition, and hand it down to their children. So strong is the influence of this cause, that a mere suspicion of the existence of pulmonary consumption, arising from an observation of the symptoms, is strengthened into conviction by the known possibility of an inherited taint.

Next, perhaps, in the degree of influence, is cold. Allusion is not here made to the vicissitudes of weather, which so frequently occasion attacks of inflammation. Cold may act in this way as an exciting cause; but its most pernicious agency is probably connected with its long-continued and steady application. Moderate and temporary reductions of temperature are often indirectly tonic, by the reaction they occasion. But, under a steady continuance of cold, the power of reaction at length becomes exhausted, so that a condition of debility ensues; and experience has shown that the debility thus induced often assumes the character of the tuberculous diathesis. Hence, chiefly, the greater prevalence of the disease in cold than in warm climates. It is true that phthisis is said to be less prevalent in the coldest regions of the north, as, for example, in Russia, and the regions about Lake Superior upon this continent, and generally at great elevations, as at certain heights on the Andes and Himalayas, and the mountains of Europe, than in the more temperate latitudes, and in lower and warmer regions even in the same latitudes. But this apparent anomaly is easily explained. The inhabitants of the north suffer, in fact, less from cold than those further south. The intensity and steadiness of the cold in the former regions lead to precautions, both as to dress and dwellings, which effectually guard the inhabitants against its injurious influence; while the variable temperature of the latter, causing the clothing which may be no more than comfortable one day, to be oppressively hot the next, induces a disposition to submit to some inconvenience from the cold rather than to have the trouble of constant changes. The dryness, too, of the air in the north, and its consequent feeble power of conducting heat, have much influence in obviating injurious effects.* The same remarks apply to high mountainous situations; and, in addition, in regard to these, the uniformity of temperature at all seasons, so far at least as regards tropical elevations, must be taken into view. Indeed, Dr. Bowditch, of Boston, has endeavoured to show, and adduced many facts to prove that dampness is the main cause of phthisis in New England; but in ascribing the effect to this cause, we must not overlook the consideration that it is in connection only with coldness that it operates; for assuredly no parts of New England are damper than the rice-grounds of Georgia and South Carolina, where phthisis is scarcely known. It is probably only by giving greater effect to cold that dampness acts. It is a great mistake to attempt to harden the body against the inclemencies of the weather in winter by light clothing in the day, and insufficient covering at night. Many may succeed, but many also will perish in the process. This fact has been strongly exemplified within my own observation. Negroes, from their greater susceptibility to cold than the whites, are much more subject to phthisis in cold or temperate climates.†

Whatever has a tendency to produce permanent or long-continued debility will generate, in some individuals, the consumptive diathesis. Hence, we may enumerate among the predisposing causes, besides that just mentioned, an insufficient diet, whether as to quantity or nutritive properties; living in an unwholesome air; sedentary habits; exhausting indulgences; grief, anxiety, disappointment whether of the affections or in business, and all other depressing emotions; long watchings; copious evacuations both spontaneous and artificial; the abuse of mercury; and the influence of various debilitating diseases. The history of phthisis affords numerous instances in which the above causes, singly or combined, have induced the disease; for, when the diathesis is sufficiently strong, no exciting cause is required to aid those which are here, not perhaps with strict propriety, denominated predisposing.

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* From observations made during a visit, in the summer season, to England, I was strongly impressed with the conviction, that the prevalence of phthisis in that country is owing, in part, to the coolness of the summer, which is often so great as to be uncomfortable, but is not sufficiently guarded against, from the inconvenience of frequently making fires, and changing clothing. The robust resist the sedative influence, and from the reaction of their systems are apparently invigorated; but the feeble, and those predisposed to phthisis, sink into that state of general depression which is most favourable to the deposition of tubercle. (*Note to the second edition.*)

† In the supplement to his *Annuaire* for 1861, M. Bouchardat very ingeniously maintains that the great cause of tuberculization is an insufficient calorification in the system, consequent either on a defective supply of the material for developing heat, or on a want of the proper appropriation of that material after its introduction. It is well known that diabetic patients often die of consumption, and, even when death proceeds from other causes, tubercles, in greater or less numbers, are generally found on post-mortem examination. This result is ascribed by M. Bouchardat to the rapid elimination from the system, by way of the kidneys, and in the form of grape-sugar, of all the starch and other heat-producing food that may be taken by the patient; so that sufficient does not remain for due calorification. He asserts, moreover, as the result of his own observation, that, if the discharge of glucose can be restrained within the daily amount of 100 grammes (between ℥iij and ℥iv), tubercles no longer form. Monkeys brought into northern latitudes from their native country almost always die of phthisis. Domestic cows kept in a confined atmosphere, and fed highly, in order to force the production of milk, are apt to die of the same disease, because the food is diverted from the purpose of generating heat. All the causes producing a state of depression favourable to the development of phthisis, as sedentary habits, confined air, insufficient alimentation, mental depression, &c., are supposed to act in the same way, by either limiting the supply of food for the calorific function, or counteracting its due appropriation Hence the great therapeutic rule of administering cod-liver oil or other fatty matters, and of exercise in the open air to favour its digestion and subsequent consumption in generating heat. (*Note to the sixth edition.*)

2. *Exciting Causes.*—Anything which is capable of irritating or inflaming the lungs, of producing in them an unusual influx of blood, or an unusual secretory effort, may act as an exciting cause of the deposition of tubercles, in persons predisposed to them. What would, in other persons under such circumstances, be organizable fibrin, or a product amenable to the vital process of absorption, becomes in these, in part at least, the matter of tubercle. Thus cold, which by its continued action is a powerful cause of the diathesis, is, by its intermittent action, a no less powerful exciting cause of the local affection. It operates chiefly by producing catarrh, though pneumonia and pleurisy, which are equally the result of it, appear sometimes to be the immediate predecessors of the tuberculous deposition. Other causes, capable of producing bronchitis or pneumonia, may through these give rise to the development of phthisis. Such are the inhalation of acrid gases or vapours, or irritating powders, any habitual and excessive exertion of the lungs, and external violence. The febrile movement appears to be an efficient exciting cause; as are also the suppression of long-continued morbid evacuations, the too hasty resolution of external scrofulous tumours, the healing of old ulcers especially fistula in ano, and the cessation of the menses and of child-bearing. Tight lacing has been accused of frequently inducing consumption; and it is highly probable that, by interfering with the functions of the lungs, it may favour the formation of tubercles in those predisposed to them.

There are certain influences, which, though referrible to one or both of the above heads, require a separate notice.

Age is not without influence in the production of phthisis. The time of life at which there is the greatest proneness to the disease appears to be for some years after the cessation of growth. The force of nutrition, or that by which the aliment prepared by the processes ot digestion and sanguification is appropriated to the growth or repair of the organs, is now much diminished, and probably in a greater degree than that of the two functions intended to supply it with material. This material, therefore, being in excess, is thrown out in a less elaborate condition, and, in those of a consumptive constitution, takes the form of tubercle. In this view of it, age may be considered as an exciting cause of the disease. Perhaps the ten years in which the greatest number of cases of phthisis originate are from seventeen to twenty-seven. It will be observed that this is somewhat different from the age at which the greatest number of deaths occur. This, according to Sir James Clarke, is from twenty to thirty. Louis places it between twenty and forty. The period of life in the next degree prolific in phthisis is infancy. According to the returns of the Registrar-general of England, as large a proportion of old persons to the actual number living die from phthisis as of those in earlier life. (*Med. T. and G.*, Aug. 1863, p. 168.) But the former notion of the comparative immunity of old age is too hastily inferred to have been a popular error, based on the smaller actual number of deaths in the old. Within my own observation, phthisis very rarely originates with the old; and I presume that the experience of others coincides with my own; as the impression to that effect is almost universal. The probable cause of the seeming contradiction between the official returns and prevalent opinion is, that many protracted cases are carried from comparatively early life into old age, and the deaths in these instances, even more frequent in my own experience than cases originating in advanced life, go to swell the mortality of the aged from this cause.

Sex.—The disease is much more common in women than in men, occurs in them at an earlier age, and is generally more rapid in its progress. There are various causes for this difference. In the first place, the original organization of the female is more delicate, and exposes her consequently more to diseases of relaxation and debility. In the next place, the sedentary habits of women, as well as their greater sensibility and probably greater exposure to the various depressing emotions, and their frequent and anxious watchings in the confined and impure air of the sick chamber, have no little influence in producing the consumptive diathesis. Though less frequently exposed than men to the exciting causes, they are, from their previous habits of life and modes of dress, much more readily affected by them. Of 123 hospital cases noticed by Louis, 70 were in women. It is probable that the proportion of females is even larger than this in the higher walks of life. The earlier age at which woman attains her full growth, accounts for the earlier occurrence of the disease, as a general rule, in her case.

Occupations.—The sedentary occupations are much more favourable to the occurrence of consumption than those which require vigorous exercise, especially in the open air. Hence weavers, tailors, milliners, sempstresses, teachers, students, and the inmates of convents and penitentiaries are thought to be peculiarly liable to it. Occupations which expose the individual to the inhalation of acrid or irritating particles of matter, such as stone-cutting, dry-grinding, feather-dressing, and brush-making, are accused of a tendency to develope the disease.

Residence.—The influence of a cold climate has been already noticed. It is thought that a damp and variable climate is more injurious than one which is steadily cold and dry. Even within the same country, consumption is found to prevail more in low and damp situations than in the elevated and dry. The sea-coast is peculiarly liable to it, partly in consequence of its exposure to the dampness of the ocean, but probably still more from the saline particles driven up into the air by storms and breakers, which serve to irritate the lungs when inhaled. On this account it is, probably, more than from difference of latitude, that Philadelphia is less exposed to phthisis than New York or Boston; for there is little difference between these two latter cities. The climate in the north-western portions of our country, in the vicinity, for example, of Lake Superior, is said to be highly favourable to consumptive patients, in consequence of its uniformity and dryness in winter.*

Other Diseases.—These act in producing phthisis, partly by the relaxed and debilitated state in which they are apt to leave the system, and partly by a direct irritant influence upon the lungs, favouring the development of tubercles. It is, however, denied by some, and by Louis among the number, that the inflammatory pulmonary affections have been proved to exercise more influence in inducing phthisis than other diseases of a febrile character. But the general experience and opinion of the profession are in opposition to this view. Some go so far as to maintain that tubercles always originate from inflammation acting on a peculiar diathesis. But this dogma has certainly never been proved. Tubercles have frequently been observed, without the least evidence of inflammation other than that which is afforded by their own existence; and to assert this as a proof is to beg the question. The truth probably lies between these extreme opinions. There can be little doubt that tubercles are often deposited from the mere intensity of the diathesis, without the slightest inflammatory excitement of the part; and this I am disposed to believe is most frequently the case; but there is, I think, as little doubt, that active congestion or inflammation often causes an earlier development than would otherwise take place, and sometimes perhaps gives rise to them, when, without its occurrence, the patient might escape altogether. The diseases which are peculiarly prone to be followed by phthisis are measles, small-pox, scarlatina, hooping-cough, typhoid fever, and the pulmonary inflammations, bronchitis, pleurisy, and pneumonia. Dr. J. Henry Bennet, of London, has recently called attention to the extreme frequency with which chronic uterine diseases give rise to phthisis through the debility caused by them; and another strong reason is thus afforded for the prompt treatment of these disorders.

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* This is confirmed by the reports of the officers of the U. S. army stationed in those regions; and, in a communication made by Dr. S. Kneeland to the Boston Medical and Surgical Journal (Jan. 7, 1858), it is stated that the writer, who passed nearly a year in the vicinity of Lake Superior in 1856–7, never met with a case of phthisis during the period of his residence there. A similar statement is made by Dr. Hayes, one of the officers who attended the late Dr. Kane's exploratory voyage into the Arctic regions, in relation to the absence of tuberculous disease among the Esquimaux. (*St. Louis Med. and Surg. Journ.*, Nov. 1857, p. 576.)—*Note to the fifth edition.*

Diagnosis.

It is in general only in the first stage that there is much difficulty in recognizing phthisis. When a short cough, either quite dry or attended only with a slight mucous expectoration, continues for weeks or months with more or less general emaciation, which cannot be explained by a loss of appetite or any apparent failure of digestion, there is reason to suspect the existence of tubercles. If to these symptoms are superadded irregular pains between the shoulders or about the breast, frequency of pulse, and shortness of breath upon exertion, the suspicion becomes very strong. An attack of hæmoptysis would now complete the proof. In the absence of this, or in connection with it, the occurrence of dulness upon percussion in the subclavicular region, and any considerable deviation from their healthy character in the respiratory sounds, or vocal resonance, in the same part, would, in addition to the symptoms above mentioned, render the existence of phthisis quite certain. But, in numerous instances, the characteristic symptoms and physical signs are much less distinct; and in all doubtful cases it is best, before giving a decided opinion, to wait for the development of further evidence. This is afforded by the appearance of the peculiar expectoration already described, the occurrence of hectic fever, and the physical signs indicating a cavity near the summit of the lungs. There is, however, one condition of the disease in which the physical signs often quite fail in establishing the diagnosis, and it is necessary to depend upon the somewhat equivocal evidence of the general symptoms. Allusion is here had to the form of acute phthisis characterized by the diffusion of miliary tubercles. A pretty good guess may be made, in instances of this kind, from the character and course of the symptoms; but the only absolute proof is that afforded by dissection.*

Bronchitis is the complaint to which phthisis bears the closest resemblance in its general symptoms, and with which it is most liable to be confounded. But in the early stage, this affection, if sufficiently severe to impair the general health, is accompanied with more fever than phthisis, and, if mild, does not then present the emaciation, nor, in general, the frequent pulse of the latter affection. It is, moreover, unattended with hæmoptysis; the expectoration is usually much more copious than in the tuberculous affection; and the disease, instead of remaining long stationary or advancing slowly, is marked by successive and comparatively rapid stages of progress and decline. Those auscultatory signs which are common to the two affections are in bronchitis spread more or less over the lungs, while, in phthisis, they are confined to the upper portion; and the dulness on percussion beneath the clavicle, as well as the sinking of the chest at the same spot, so characteristic of the latter, are wanting in the former. The greatest difficulty is in discriminating between bronchitis, and those cases of acute phthisis in which miliary tubercles are disseminated equably through the lungs. As before stated, the physical signs may here fail entirely; but there is a difference in the physiognomy of the two diseases by which they can be distinguished with much probability, if not an approach to certainty. The points of this difference have been already referred to. (See *pages* 89, 90.) The persistence for a long time of a mucous or submucous rale throughout one or both lungs, unchanged by all the treatment which usually proves effectual in chronic bronchitis, and attended with emaciation, frequent pulse, night-sweats, and other general symptoms of phthisis, would indicate with some degree of certainty the existence of the miliary form of that complaint. In the advanced stages of the two diseases, there is in general little difficulty in the diagnosis. The absence of the peculiar sputa of phthisis (see *page* 81), the inferior degree of emaciation, the total want of dulness on percussion and of the ordinary signs of a cavity, together with the previous course of the complaint, and its exemption from attacks of hæmoptysis, are sufficient to distinguish the bronchial from the tuberculous disease. It is only when dilatation of the tubes coincides with bronchitis, that much embarrassment occurs. In such cases, signs of a cavity exist; but this cavity is not often at the summit of the lungs, the resonance on percussion is not so much diminished as in phthisis, and the character of the signs is more unchangeable; and these circumstances, taken in connection with the absence, or much less degree, of some of the characteristic general symptoms of tubercles, such as pains in the chest, emaciation, tuberculous expectoration, and occasional hæmoptysis, enable the practitioner, for the most part, to arrive at a just conclusion.

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* M. Beau believes that he has discovered an almost invariable symptom in phthisis, which may be useful in the diagnosis of doubtful cases. This is tenderness on pressure with the finger in the anterior intercostal spaces, near their sternal extremity. In the early stages, this is confined to the upper spaces, being greatest in the first. (See *Ed. Monthly Retrosp. of Med. Sci.*, A.D. 1849, p. 290.)

Pneumonia in its chronic form might present some analogy with phthisis, but is a rare disease, and still more rarely occupies the upper part of the lung. The previous course of the symptoms would also serve to distinguish the affection. If attended with an abscess, there might be greater difficulty; but the situation of the abscess in the lower lobe, and the previous signs of pneumonia, such as the crepitant rale followed by bronchial respiration, and the rusty and viscid sputa, would be sufficiently diagnostic.

Gangrenous abscess may be distinguished by its lower position, as well as by the intense fetor of the expectoration, and the want of the characteristic tuberculous sputa.

Cirrhosis of the lung might readily be confounded with phthisis; but the diagnosis will be given when the former affection is considered.

Pulmonary emphysema occurring near the summit of one lung only, and attended with catarrh, might lead to the suspicion, in consequence of the greater sonorousness on percussion of the side affected, that the sound side was the seat of tubercles; but the affection may be distinguished by the greater feebleness of respiration on the more sonorous side, and by the swelling or bulging of the chest often attendant on emphysema.

Pneumothorax, which might possibly be mistaken for a large tuberculous cavity, is distinguishable by its loud tympanitic resonance on percussion, by the want of any depression of the chest in the part, by the frequently movable character of the sounds, and by the coexistence of liquid effusion.

Not unfrequently the diseases above mentioned are mingled with phthisis, and serve to mask it, so that it may not for some time even be suspected; but a careful examination will generally enable the physician to detect its peculiar signs, and the more readily, as these are almost always to be found in the upper part of the chest, while those which characterize the other affections are generally connected with the lower part.

Prognosis.

In the very great majority of cases, this is certainly unfavourable; but I am not one of those who believe that phthisis is in all cases necessarily fatal. On the contrary, I believe that, in one stage or another, it is occasionally cured, or at least ends in perfect recovery. It is no very unfrequent event to see threatening symptoms of phthisis give way under suitable treatment. It cannot be proved, with absolute certainty, that these symptoms were tuberculous; because the evidence of dissection is wanting, and the physical signs are not sufficiently positive, in mild cases of early phthisis, to authorize a certain conclusion. But they are undistinguishable from symptoms, which, in other cases, are the forerunners of confirmed phthisis; and we have abundant evidence from dissection, that tubercles are capable of undergoing favourable modifications. The probability is, that the tuberculous matter is absorbed, and sometimes, as shown by dissection, replaced by calcareous matter; and, if the diathesis be so far subdued as to prevent the deposition of other tubercles, before these have completely run their course, the disease may be said to be cured. The circumstance that such remains of tubercles are not unfrequently found in the lungs of old persons, who have died of other diseases, would seem to show that these cures are sometimes permanent.

But this is not all. It occasionally happens that consumptive symptoms disappear entirely, even in the second stage of the disease, after the formation of a cavity. This event, it is true, is comparatively rare; but some such cases have probably fallen within the notice of almost every practitioner of extensive experience. Even should the disease ultimately return, still, the case may be said to have been cured; as the occurrence of a second attack of pneumonia is certainly no proof that the first was not cured. But there have been cases in which no return of the symptoms has taken place during the residue of life, even though considerably protracted. Two instances of this kind have occurred in medical men of this city. One of the patients was affected, when a young man, with all the symptoms of phthisis, including frequent attacks of hæmoptysis, severe cough, hectic fever, &c., from which he completely recovered, and continued exempt up to the time of his death, which occurred many years afterwards of typhoid fever. (See *N. Am. Med. and Surg. Journ.*, viii. 277.) The other was my preceptor and friend, the late Dr. Joseph Parrish, who in early life laboured for a time under the symptoms of phthisis, and, after his death, at an advanced age, was found to have several cicatrices in the upper part of one lung, which were obviously the remains of tuberculous cavities. (See *Am. Journ of Med. Sci.*, xxvi. 256.) The probabilities upon the whole are, that each tubercle has a tendency towards health, and, if alone, would in time end in perfect recovery; so that the great fatality in phthisis depends upon the continued predisposition which causes the constant or frequently repeated deposition of other tubercles, before those first deposited have had time to run a favourable course. We may, therefore, always entertain some hope, if applied to in the early stage, in cases of no great severity, of seeing a cure effected; and, even in the second stage, when the diathesis is not very strong, or the local disease extensive, there is no reason for absolute despair. Since the introduction of cod-liver oil into use, I have seen several cases of apparent phthisis in the early stage arrested; at least one case in the advanced stage, with a cavity, and general symptoms of the most threatening character, quite cured; and many cases in various degrees amended, of which I have been unable to trace the ultimate result. The post-mortem observations of Prof. Bennett, of Edinburgh, made in vast numbers in the hospital of that city, have shown that from one-third to one-fourth of all who die after the age of forty exhibit cretaceous masses, puckerings, or other evidences of previous tubercles in the lungs, which have undergone spontaneous cure; and similar examinations made by MM. Rogée and Boudet, in the hospitals of Paris, give analogous results. In his work on Pulmonary Tuberculosis, Prof. Bennett gives in detail several cases, seen by him during life, which, upon death subsequently from other diseases, have shown undoubted evidence in the lungs of pre-existing tuberculous deposit. There can, therefore, scarcely be a doubt of the occasional cure of phthisis. Even when there is no chance of ultimate recovery, we may hope to be able very much to prolong the duration of the complaint, and sometimes even to add years to a valuable life. If the second stage is clearly established, with severe constitutional symptoms, and the physical signs of extensive disease in the lungs, there is little ground for hope. When to the ordinary symptoms, in such instances, are superadded continued vomiting and diarrhœa, the case may be considered as quite desperate; and speedy death may be expected.

Treatment.

As tubercles, when once formed, almost always run their course, notwithstanding all the remedies that can be employed, the prominent indications in the treatment of phthisis appear to be, *first*, to prevent their further deposition, and, *secondly*, to guard the lungs and the system at large against their injurious influence during their progress. The first of these indications is all-important, and should claim the especial attention of the practitioner.

1. *To prevent the further Deposition of Tubercles or Tuberculous Matter.*—In fulfilling this indication, there are two objects to be aimed at; *first*, to correct the predisposition, and, *secondly*, to obviate the influence of the causes which excite the predisposition into action.

So far as we understand the tuberculous diathesis, it consists in a depreciation of the general tone and vigour of the system, and of the character of the blood. Our object must, therefore, be to restore due vigour to the solids, and a healthy state to the circulating fluid. The remedy best adapted to these ends is *exercise in the open air*. To be effective, this must be vigorous and long continued. It is not sufficient to take a short walk now and then when the weather is pleasant. Such exercise is altogether inadequate to the end in view, of changing the constitution of the patient. It must be sustained daily, and as far as possible unremittingly, for months and even for years. There is no necessity for carrying it to the point of great fatigue. It should at first be moderate, not longer continued nor severer than the patient can well bear, and gradually and perseveringly increased, as the increasing strength may permit. Cold weather should not be considered as any obstacle. By clothing himself warmly, and carefully protecting himself from the wet, the patient may, in the early stage of the disease, and frequently also in its second stage, venture out at all seasons and in almost any weather. Certainly it is better to encounter freely all the rigors of winter weather, properly guarded, than to shut one's self up for a whole season in a warm room of regulated temperature, as recommended by some. Nevertheless, the patient may be influenced, in this respect, in some degree by his own experience. If he find that exposure in bad weather occasions frequent attacks of catarrh, it may be best to avoid it. The contrary, however, will generally be found to be the case, with the precautions before mentioned; and the liability to catarrh will diminish with the amount of exposure. Cold dry weather may almost always be encountered with impunity. Of course, during the existence of any considerable hemorrhage from the lungs, or of intercurrent attacks of pleurisy, pneumonia, or bronchitis, especially when attended with fever, it will be proper to intermit the exercise until they shall have been removed; after which it should be resumed as before. The remarks of the late Dr. Joseph Parrish upon this subject are highly valuable. That excellent physician, having early in his practice observed the futility of the modes of treating phthisis then in vogue, and indeed their frequently marked effect in hastening the march of the disease, was induced to throw them all aside, and return to the practice recommended by Sydenham. The following remarks are extracted from a paper of his, published in the *North American Medical and Surgical Journal* (viii. 279). "Vigorous exercise, and free exposure to the air, are by far the most efficient remedies in pulmonary consumption. It is not, however, that kind of exercise usually prescribed for invalids—an occasional walk or ride in pleasant weather, and strict confinement in the intervals—from which much good is to be expected. Daily and long-continued riding on horseback, or in carriages over rough roads, is, perhaps, the best mode of exercise; but, where this cannot be commanded, unremitting exertion of almost any kind in the open air, amounting even to labour, will be found highly beneficial. Nor should the weather be scrupulously studied. Though I would not advise a consumptive patient to expose himself recklessly to the severest inclemencies of the weather, I would nevertheless warn him against allowing the dread of taking cold to confine him on every occasion when the temperature may be low, or the skies overcast. I may be told that the patient is often too feeble to bear the exertion; but, except in the last stage, when every remedy must prove unavailing, I believe there are few who cannot use exercise without doors; and it sometimes happens that they who are exceedingly debilitated find, upon making the trial, that their strength is increased by the effort, and that the more they exert themselves the better able they are to support the exertion."

Experience, from the time of Sydenham, has shown that the best mode of taking exercise, upon the whole, for consumptive patients, is on horseback. In his own case, Dr. Parrish resorted to the plan of driving over the rough pavements of the city, in a vehicle without springs, in his ordinary professional rounds; and to this cause, probably, as much as to any other, owed the fortunate result. The great difficulty, in relation to exercise, is in inducing the patient to submit perseveringly to the necessary hardships. Hence, they are most fortunate who are so situated as to be compelled to exert themselves. It has often been observed that consumptive patients entering into military service have entirely surmounted the disease; and it will be found, in civil life, that they who are under the necessity of exerting themselves to the utmost to gain bread are apt in the end to fare the best. The life of a country physician who visits his patients on horseback is, probably, as conducive as any other to a favourable result in phthisis. The best substitute for this compulsory exercise is a long journey on horseback, or in a somewhat rough vehicle; and, if some object of business or pleasure, without reference to health, can be connected with the journey, it will be so much the better.*

Another important measure is *a proper regulation of the temperature of*

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* In a paper by Dr. B. H. Washington, of Missouri, it is maintained that tuberculous deposition is owing to imperfect assimilation of the materials of the blood, that this may result in part from imperfect respiration, and that the reason why tubercles are preferably deposited in the upper part of the lungs is that here respiration is most imperfectly performed, and the blood therefore least perfectly assimilated. As a method of cure, founded on this basis, he recommends, along with the other hygienic methods, the complete expansion of the chest in respiration. This must be done by frequently repeated voluntary efforts, which, however, should be suspended when they begin to produce vertigo. (Washington *on Assimilation, Consumption and Scrofula*, Louisville, 1856.)

the body. The patient should sedulously guard against the general depressing influence of cold. This he is not to do by shutting himself up in a heated apartment during winter. He would thus lose the advantages of exercise and pure air, which are of greater importance than the uniformity of temperature. The best plan is to guard himself against the cold by flannel next the skin, and sufficient exterior covering to render him perfectly comfortable; care being taken, at the same time, to protect the lungs, if the temperature be very low, or the bronchia peculiarly sensitive, by means of two or three thicknesses of gauze worn over the face as a veil. Advantage will often accrue, with the present style of dress, from covering the breast by a dressed rabbit skin, or by cotton wadding quilted between pieces of silk, worn under the shirt. While in the house, the patient should take care never to allow himself to feel cold, and especially should cover himself warmly in bed. While thus avoiding the general sedative influence of cold, he should equally avoid that partial application of it, and that sudden alternation with warmth, which are so apt to occasion bronchial or other inflammation. He should, therefore, keep his feet and hands dry and warm, should take care never to expose himself to cold when perspiring, and should avoid partial currents of air as much as possible, consistently with the more important object already mentioned. To ensure the advantages of warmth, it may be advisable that, if residing in a cold region, he should remove during winter to one which is warmer. Another benefit resulting from such a removal is the opportunity which it affords for constant exercise out of doors, without the danger of taking cold. In choosing a place of residence, preference should be given to those situations, which are at the same time dry and of a uniform temperature. For Americans, there is probably no better residence than the interior of Georgia, Alabama, and Florida. The immense pine forests of these regions may add the advantages of their exhalations to those afforded by the comparative dryness and warmth of the climate. Some of the West India islands may also be selected; and preference is generally given to Santa Cruz or Cuba. In Europe, no situation is probably liable to so little objection as the south-eastern parts of Spain. Almost always, however, a situation should be selected at some distance from the sea-shore. Independently of the dampness of the air, there is another great disadvantage, resulting from the salt driven into the atmosphere with the spray, and carried for some distance inland. Experience has shown that this is often very irritating to delicate lungs. When it is impossible for the patient to remove to a distant region, he should endeavour to select the driest spot within his reach near home.

But, while thus careful to guard against cold, the patient should exercise some caution also in relation to excessive heat. The warmest portions of our summers are almost as injurious to consumptive patients, especially in the advanced stages, as the cold of winter. "From my own observations," says Dr. Chapman, "I am pretty well persuaded that, in this city (Philadelphia), the greatest degree of mortality is in the early part of the spring, and the close of summer; the effects of intense heat being more baneful than those of severe cold, and quite equal to the influence of the fluctuations in our vernal weather." (*Lect. on Thoracic and Abdom. Dis.*, p. 45.) If, therefore, the patient is to seek a warm climate in winter, he will find advantage, during the heats of summer, in a resort to some elevated mountainous district, not so high as to be involved in frequent fogs, and affording good opportunities for horseback exercise. The author has found no situation superior, in these respects, to Schooley's Mountain in New Jersey.

It is a question which experience must determine, whether the extremely cold, uniform, and dry air of our high northern latitudes may not operate more beneficially on the health of persons consumptively disposed, than the more relaxing climate of the south; care being taken by sufficient warm clothing to prevent the depressing influence of a long-continued and constant coldness of the body, which has already been said to be probably one of the strongest predisposing causes of the disease.*

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* Bearing on the subject of a suitable climate for consumptive patients, or rather for those who may be supposed to have a tendency to phthisis, are certain statements and opinions recently advanced, which tend to throw some doubt upon the previous almost universal conviction, that warm latitudes are less favourable to the generation of tuberculous affections than the cold or temperate. This opinion is based chiefly on army returns, from which it would appear that soldiers are as apt to be carried off by phthisis in warm, even equatorial regions, as in the coldest and most inclement. But it is obvious that various other considerations here enter into the question besides those merely of temperature. The mortality returns of such a country as the United States, extending from the coldest regions of the North to near the boundary of the tropics in the South, and from one ocean to another, must have much more weight in the decision of the question, as affecting all orders of society, and a population exposed from birth to the special influences of the locality. A table prepared from the U. S. census returns of 1860, by Dr. Aug. A. Gould, of Boston, and published in the *Boston Med. & Surg. Journ.* (Sept. 10, 1863, p. 110), has enabled me to prepare the following statements, which, while they speak strongly in favour of very cold dry regions, such as our Lake Superior country, are not less decisive in relation to the general question of cold and warm climates as to their influence in the generation of phthisis. It is true that the perfect accuracy of these returns may be doubted; but this scarcely affects the question, because in the extensive scale on which the investigation was conducted, errors on the opposite sides would balance each other; and the result, therefore, may be relied on in its general and relative bearings. For the whole United States the returns give the mortality from phthisis as 1 out of 7·616 deaths from all diseases, or 13·129 per cent., and 1 annually out of a population of 809. Taking the two extreme Atlantic States of Maine and Georgia, omitting Florida, the scanty population of which causes the returns to be materially affected by the number of deaths among consumptive strangers, drawn thither in the hope of regaining health, the returns give for the Northern State (Maine) 1 death from 3·346 of all, or 29·888 per cent., and 1 for every 290 people; for the Southern (Georgia) 1 death from 24·061 of all, or 4·156 per cent., and 1 death to 2153 of the population. These are the extremes in reference to latitude; other circumstances, as the vicinity of the sea, &c., being nearly the same. Wisconsin may be considered as representing the extreme North, inland. For this State the returns are 1 death to 7·397, or 13·519 per cent., and 1 death to 852 inhabitants. It is thus seen that the dry interior regions of the North are much less productive of phthisis than the equally Northern regions of the coast, yet far more so than the Southern region, even though on the sea. Now, if we examine the several regions without reference to particular States, we shall find the influence of climate even remarkably conformable to latitude. The U. States may be divided into six regions: 1. the *North-eastern*, including all the New England States; 2. the *North-western*, including the seven States of Michigan, Wisconsin, Minnesota, Iowa, Ohio, Indiana, and Illinois; 3. the *North-middle*, including the five States of N. York, N. Jersey, Pennsylvania, Delaware, and Maryland; 4. the *South-middle*, embracing the seven States of Virginia, N. Carolina, Kentucky, Tennessee, Missouri, Kansas, and Arkansas; 5. the *Southern*, including the seven States of S. Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas; and 6. the *Pacific region*, including California and Oregon. The following is a table representing the positive and relative mortality of phthisis in these six regions.

REGION.	Proportion to Population.	Percentage of all Deaths.	Proportion to all Deaths.
1. North-eastern	1 to 816	25·080 per cent.	1 to 3·987
2. North-western	1 to 838	13·324 "	1 to 7·505
3. North-middle	1 to 536	17·651 "	1 to 5·648
4. South-middle	1 to 953	8·137 "	1 to 12·289
5. Southern	1 to 1548	5·192 "	1 to 19·260
6. Pacific	1 to 1611	12·673 "	1 to 7·890

From the above statistics it appears to me incontestible that, on this Continent at least, phthisis is rare in proportion to the warmth of the climate, other things being equal; and the healthiest spot in this respect is to be sought for in the interior of Florida, Southern Georgia, and Alabama, as recommended in the text from personal observation, long before I was supported by the statistical returns. (*Note to the sixth edition.*)

Some consideration is always necessary in sending a patient abroad in this disease. In severe cases, in the advanced stage, when there can be no hope of ultimate good, it would be cruel to separate him from the comforts and consolations of his own home, to suffer, and perhaps die, among strangers. Nor should he, as a general rule, be sent away while labouring under any active inflammation, which might be aggravated by the necessary exposures and disturbances of the removal.

The *regulation of the diet* constitutes also an important part in the treatment of phthisis, under the first indication. As the objects are to sustain a vigorous tone of system, and at the same time to avoid the exciting influence of pulmonary inflammation and fever, the general rule is to recommend a generous diet, but with such restrictions as shall guard against the production of an inflammatory or febrile condition. While the most nutritious articles of food may be allowed, those should be preferred which are least stimulating. Thus, farinaceous substances, milk, fish, oysters, eggs, and the lighter meats are preferable to the stronger meats which contain some stimulant principle independently of their mere nutriment; and, when the latter are employed, they should in general be boiled. Fruits, and the digestible vegetables are very suitable. But, when there is fever, local inflammation, or hemorrhage, in the early stage, animal food should be suspended, and the patient confined exclusively to fruits, vegetables, and farinaceous substances. In doubtful cases, milk, and the farinacea are excellent intermediate articles of diet. Stimulant drinks should not be allowed to persons previously unaccustomed to them, in the first stage, unless indicated by debility; at least all excess in their use should be scrupulously avoided. It is proper, also, to proportion the diet in some degree to the amount of exercise, more nutritious substances being allowed, and in greater quantity, when the patient undergoes continued bodily fatigue, than under other circumstances. In the second stage, after suppuration has fairly set in, moderately stimulant drinks, such as porter and ale, are often useful.

Mental influences are frequently important therapeutical agents in this disease. When there is reason to believe that the patient is sinking under some disappointment of the affections, or other grief or anxiety, concealed or open, every effort should be made to discover and remove the source of mischief. Intense application to study, or any sedentary business must be avoided. The hopes of the patient should be encouraged, and his tendency to cheerfulness cherished, so far as may be deemed compatible with higher interests. It is probably in part to the agreeable distraction of the mind, and the stimulating influence of a succession of pleasing or interesting novelties, that travelling owes a portion of its success as a remedial measure. Short sea voyages, in interesting regions, may be useful in the same way.

Medicines are generally of less avail in this disease than the hygienic measures already recommended. Nevertheless they are sometimes highly useful. When the system readily responds to exercise, and the other means enumerated, when the appetite and digestion remain unimpaired, and the nutrition improves, and when there is no derangement of function requiring interference, it will be best, upon the whole, to avoid energetic medicines altogether, with a single exception to be adverted to directly. But, should the case be otherwise; should the patient remain feeble and anemic, and the vital processes alluded to be inadequately performed, benefit will often accrue from the use of *mild tonics*. Of these, the one most applicable to the circumstances of phthisis is perhaps *wild-cherry bark*, the *prunus virginiana* of the U. S. Pharmacopœia. This has the advantage of uniting a tonic influence over the digestive and nutritive functions, with a sedative action upon the nervous system and the general circulation. The latter effect is strongly indicated by the great irritation of pulse, and general excitability of system, which attend and characterise this disease, often even in its earliest stage. The best plan of administering the remedy is in the form of the officinal infusion, which may be given in the dose of a large wineglassful, two, three, or four times a day, and continued for months or even years, with occasional intermissions. With the exception before referred to, there is no other medicine which has seemed to me so efficacious. It was a favourite remedy with the late Dr. Parrish, and has come into extensive use. Should this become offensive to the patient, recourse may be had to *pipsissewa*, or one of the simple bitters, as *columbo, gentian, quassia*, or *American centaury*, to which either *hydrocyanic acid* or *tincture of digitalis* may be added, when the pulse is very frequent, and the system irritable. Occasionally much good may be done by the use of the *chalybeates*, which are especially indicated in anemic cases, and in females with amenorrhœa. The preferable preparations of iron are *pill of carbonate of iron* (*U. S. Ph.*), *tartrate of iron and potassa, tincture of chloride of iron*, and *solution of iodide of iron*; but any other preparation of the metal may be selected which may happen to agree better with the stomach, taste, or prejudices of the patient. It is probably chiefly as a tonic, that *iodine* sometimes proves serviceable in the first stage of phthisis. When chalybeates are indicated, this may perhaps be given best in the form of iodide of iron; otherwise the *compound solution of iodine*, or *iodide of potassium*, should be preferred. I have no faith in the influence of this medicine in promoting absorption of the tuberculous matter. The preparations of iodine should be immediately abandoned, if found to impair the digestive process, to excite bronchial irritation, or in any other way to disturb the functions. A general corroborant impression may be made on the system by *frictions*, applied to the whole surface of the body.

But of the medicines used in phthisis no one, or any combination of them, has hitherto proved so efficient as *cod-liver oil*. When the second edition of this work was published, the experience of the author had not been favourable to that remedy; but this was simply because he had not persevered with it a sufficient length of time, in the cases in which it was employed. The oil seldom produces any very observable effect under a period of from three to six weeks; and, despairing of any good result, he had in every instance omitted it too soon. Subsequent experience has convinced him of its inestimable value. For the last fifteen or sixteen years, he has used it in nearly every case of phthisis which has come under his notice either in private or hospital practice, and almost always, when it could be retained on the stomach, with either temporary or lasting benefit. His experience coincides generally with that of the writers who have testified favourably of its effects. In the worst cases, and most advanced stages, it usually improves the condition of the patient, renders him more comfortable, and postpones the fatal issue. Under less desperate circumstances, it often arrests for a time the march of the disease, giving hopes even of ultimate recovery; and, in some few instances, these hopes are justified by the result, so far as time has hitherto enabled us to judge. Given at the first appearance of the symptoms, I have frequently found it to set them aside altogether, and believe that, with the aid of other suitable remedies, it is capable of effecting permanent cures in many instances. Its observable effects are usually to improve the digestion, to render the patient fatter and stronger, to diminish the frequency of the pulse and check the sweats at night, to relieve the cough, and, in fine, greatly to ameliorate all the general symptoms. The patient often becomes fleshy, exchanges his paleness for a ruddy or healthy colour, and feels himself nearly if not quite well. Unhappily, the physical signs do not generally undergo the same rapid improvement. If there was evidence of considerable solid deposition, this goes on to softening and the formation of a cavity; if there was a cavity at the commencement of the treatment, this not unfrequently enlarges, while others form; and, after a period of very flattering amendment, perhaps for months, perhaps for a year or more, the symptoms return, and the patient too often sinks at last. Yet it is not always so. Sometimes suspicious physical signs in the early stage entirely disappear, and cavities either remain stationary or heal. The following, so far as I am capable of judging from my own observation, and the recorded experience of others, appears to be the real value of the remedy. It does not act as a specific, and is wholly incapable of producing, by any direct influence of its own, the removal of the deposited tuberculous matter. But it invigorates digestion, improves the character of the blood, and by a peculiar power modifies the nutritive process, so as to obviate, in a greater or less degree, the tendency to the deposition of tuberculous matter. When this tendency is not very strong, and other suitable measures are made to co-operate with the oil, it appears capable of arresting the further formation of tubercles altogether. But the matter deposited must pass through its own destined changes. If small in quantity, as in the earliest stage of the disease, it may undergo the calcareous metamorphosis, and thus cease to do harm. If larger, it must soften and be discharged, leaving a cavity, which may ultimately heal, if not increased by further accessions of tubercle. If abundant, it must undergo the same change, and then must necessarily prove fatal, should so much of the lung be destroyed in the process as to render the remainder insufficient to fulfil the purposes of respiration, or should the strength be inadequate to support the exhausting effects of the necessary irritation and suppuration. It is seen, therefore, that cod-liver oil, though a very valuable agent, perhaps the most valuable, should be looked on only as one of the means of confirming the general health, and thus affording the best possible protection against the further progress of the malady, and enabling the system to withstand the depressing and exhausting influences necessarily exerted upon it in the elimination of the tuberculous matter. These views are certainly encouraging; and they would seem to be supported by the fact of the considerable diminution of the general mortality from phthisis, as evinced by the statistical reports, in the city of Philadelphia, since the introduction of cod-liver oil into use.* But great care must be taken to guard against the error of relying on this alone, to the neglect of exercise, exposure to pure air, and the various other methods of invigorating the system, already referred to. A tablespoonful of the oil should be given three times a day, and the remedy persevered in for many months, nay, interruptedly, even for years, should it continue to agree with the patient, and the disease not appear to be sooner eradicated. As the diathesis is often constitutional and inherited, it will be necessary to be always on the watch, even after the disappearance of the symptoms, in order to meet them promptly should they return. As the oil favours the production of a rich blood, it is obvious that, upon the occurrence of hæmoptysis or acute inflammation, it should be suspended until these have been subdued, and then resumed. For the best modes of administering it, and various other points in relation to it, of interest to the physician, the reader is referred to the last edition of the *U. S. Dispensatory*.*

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* From a statistical table prepared by Dr. Condie, of the relative number of deaths from phthisis in Philadelphia (*Transactions of the College of Physicians of Philadelphia*, N. S., i. 261), it appears that, during the ten years from 1840 to 1849 inclusive, the average proportion of mortality from this cause was 1 to about 6·76 from all causes, or 14·8 per cent.; very nearly the same as the average of the twenty preceding years (see *page* 70), and showing a striking uniformity in this respect through a long period of time. In the years 1850 and 1851, which followed, the average had rapidly diminished to 1 in 8·83, or about 12 per cent. (see *4th ed.*, ii. 96). Now, as there had been no other change in the treatment during these latter years, and no other known cause to which this extraordinary effect could be ascribed, except simply the introduction of cod-liver oil, as a remedy, into general use, the inference seemed justifiable that the favourable change was due to this agency. But, in making this statement in former editions. I expressed the apprehension that, as the effects of the oil are generally rather to protract than to cure the disease, we might find the average mortality to rise in subsequent years, in consequence of accumulation from the deaths of the postponed cases. This apprehension was justified by the result; for, during the six years from 1852 to 1857 inclusive, the returns gave the average mortality at 1 to 6·67, almost precisely that which formerly prevailed. But even this I considered a very encouraging state of things; for, as the mortality had not increased, by the accumulation of the postponed cases, beyond the old proportion, it followed that, when the effects of these cases should cease to tell on the returns, we should find a considerable reduction in the mortality to be placed to the account of the oil. And so it has happened. On examining the tables of mortality presented by Dr. Jewell to our College of Physicians, from the year 1858 to 1864 inclusive, a period of seven years, I find the average mortality to have been 1 in 7·6, or about 13·16 per cent., which, if the result was owing to cod-liver oil, as I believe it to have been, gives, as the effect of the oil, a diminution in the mortality of between one-sixth and one-seventh. The highest relative mortality from phthisis during these seven years was in 1859, being 1 to 6·08, owing to a great reduction in the general mortality during that year; the lowest was in the last year, namely, 1864, when it was but 1 to 8·42. (*Note to the sixth edition.*)

Among the measures requisite for the fulfilment of the first indication is attention to the various functions, which must be maintained in as healthy a condition as possible. It would be altogether superfluous to point out here the means that may become necessary for this purpose. They are mentioned elsewhere, under the heads of the several diseases consisting in derangement of these functions. It will be sufficient to call attention to such of the functions as most frequently require medical interference. The digestive organs should be especially attended to; dyspepsia, constipation, and diarrhœa should be corrected by means the least calculated to diminish the strength of the patient; the hepatic function should be sedulously guarded against derangement; and the menses, if suppressed, should be restored as speedily as possible.

The measures above recommended are calculated to correct the tuberculous diathesis. It comes next in order to notice those by which the influence of the exciting causes may be obviated. As the chief exciting causes are such as occasion irritation or inflammation of some portion of the lungs or their investment, attention should be directed to prevent these effects, and to correct them when they take place. For this purpose, the patient should clothe himself warmly, should avoid unnecessary exposure to vicissitudes of temperature, and especially to cold when perspiring with heat, should guard himself against the inhalation of noxious vapours or irritating powders, and, in pursuing the various measures recommended for the general health, should always endeavour to restrain them within the point of producing inflammatory or febrile action. Should inflammation occur, it ought to be treated by measures least calculated to exhaust still further the failing powers of the system. Blood should be taken less freely than in the same affection under other circumstances; and local bleeding and blistering should be preferred to venesection, where there is a good probability that they will answer the purpose. As the arresting of habitual discharges, and the removal of long-established external diseases, sometimes prove exciting causes of phthisis, it is proper, in this place, to put the practitioner upon his guard against a too hasty attempt to cure such affections. Thus, it is better, as a general rule, that old ulcers on the legs, fistula in ano, hemorrhoids, and external scrofulous tumours should be encouraged as safe outlets of the morbid tendencies, than that any efforts should be made to get rid of them. In arranging his remedial plans, the physician should bear in mind the effects of pregnancy and lactation in checking the progress of phthisis, if not sometimes in arresting it altogether.

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* Other fixed oils, both animal and vegetable, have been employed as substitutes for the cod-liver oil, but none, so far as I can gather from a general comparison of sentiment, are altogether equal in their effects. Dr. Th. Thompson has found good effects from sperm oil, neat's-foot oil, and cocoa-nut oil, the last of which he thinks possesses similar properties to those of cod-liver oil. (*Clin. Lect. on Pul. Consump.*, Am. ed., pp. 120, 122, and 128.) Under the impression that the oil owed its virtues to iodine, an attempt has been made to substitute for it other fixed oils impregnated with that medicine; but experience has determined unfavourably as to the efficacy of the measure. (*Arch. Gén.*, 4e *sér.*, xxvii. 354.)—*Note to the fourth edition.*

The foregoing remarks are applicable to all stages of phthisis; for in all stages the only hope of cure is to prevent the further deposition of tubercles. Yet, when the amount of pectoral disease, as ascertained by the physical signs, is so great, and the strength of the patient, as evinced by the general symptoms, so much exhausted, that the disease must necessarily prove fatal in a short time, it would be proper to urge the remedial measures suggested only so far as may be quite compatible with the comfort of the patient, which, under such circumstances, becomes the chief object of attention.

2. *To obviate the Effects of Tubercles.*—As it is through these effects that all the sufferings of the patient arise, and that death comes at last, it is highly important to correct them as far as possible; and, though our powers in this respect are limited, we are yet able to do much towards promoting comfort, prolonging life, and sometimes towards effecting a cure.

Cough.—This, when troublesome or violent, must be alleviated, as, by agitating the lungs and disturbing sleep, it proves positively injurious. Demulcents may be first tried, either in the form of lozenges, to be held in the mouth and allowed slowly to dissolve, or in the liquid form, to be occasionally sipped. Should these fail, it will be necessary to conjoin narcotic remedies with them. When the cough is one of mere irritation, or when it is attended with pretty free expectoration, no remedy is so efficient as opium, in some one of its various forms of preparation. Of these, the one should be preferred, in favour of which experience may pronounce in each particular case. Upon the whole, I prefer one of the salts of morphia, as they have appeared to me less disposed than opium, or most of its other preparations, to produce constipation, or restrain the bronchial secretion. Small doses, not exceeding the fifth or sixth of a grain of opium, or its equivalent, repeated two, three, or four times a day, should be given at first; and the inevitable tendency to increase the dose should be restrained, as far as may be at all compatible with the comfort of the patient This remark is applicable to the other narcotics also. When the cough depends upon bronchitis, and the indication to promote expectoration is prominent, or when opium disagrees with the patient, as occasionally happens, hyoscyamus, lactucarium, conium, stramonium, belladonna, or hydrocyanic acid, may be substituted. Aconite and chloroform, internally administered, may also be tried. The narcotic employed should be given with mucilage or syrup, or combined with other ingredients in expectorant mixtures; and it may be associated with almost any of the medicines which may be used to meet the indications of the disease. Sometimes the cough is very much aggravated by the irritation of an elongated uvula, which, in such a case, if not sufficiently contracted by astringents, should be amputated.

Dyspnœa.—So far as this is dependent solely upon organic disease of the lungs, whether tuberculous or inflammatory, it will yield only to measures addressed to that condition; but there is occasionally much dyspnœa, arising from nervous derangement, which may be advantageously treated by the nervous stimulants and narcotics, such as assafetida, compound spirit of ether, aromatic spirit of ammonia, tincture of lobelia, extract of stramonium, &c., separately, or variously combined, to suit individual cases. Occasionally, too, relief may be obtained from the inhalation of the vapours of ether, camphor, or tincture of conium, or of the smoke of stramonium or tobacco; though these means should be employed with caution.

Hæmoptysis.—The hemorrhage from the lungs frequently requires attention. Sometimes it affords relief to the pulmonary symptoms, and, in this case, if moderate, may be allowed to continue until it shall subside spontaneously, as will generally happen in the course of a few days. But, if considerable, or not disposed to cease, it becomes an object of treatment. The same measures are to be employed as recommended under hæmoptysis; but it should always be borne in mind, that, in phthisis, the great object is to husband the strength; and blood-letting, therefore, though it may be necessary if there is much general excitement with a strong full pulse, should be more moderate than might be deemed proper in cases unconnected with tubercles. As a general rule, it will be better to lessen the pulmonary congestion by cups or leeches to the chest, and the subsequent application of a blister, if necessary; while the patient is kept at rest, upon a low diet, and under the use of refrigerating or sedative medicines, such as the antimonials, citrate of potassa, nitre, or ipecacuanha, with cool drinks. A little common salt taken undissolved into the mouth, and swallowed in that state, will often at once check the hemorrhage. If unattended with much fever, or symptoms of local congestion, it may be treated with astringents, as acetate of lead, kino, rhatany, or tannic acid, which may often be usefully combined with opium and ipecacuanha in minute doses. I have repeatedly found the hemorrhage to yield very happily to oil of turpentine, or to ergot, when the astringents have failed.

Pectoral Pains.—In the early stages of the disease, as the pains are probably connected frequently with inflammation of the pulmonary tissue or pleura, excited by the neighbourhood of the tubercles, it may be proper to treat them by the occasional application of a few cups or leeches, which may be followed or alternated with small blisters, allowed to heal and then reapplied. When the pains are moderate, it will often be sufficient to employ friction, dry cups, or some rubefacient liniment, such as liniment of ammonia, oil of turpentine diluted or not with olive oil according to the susceptibility of the skin, tincture of capsicum, &c.; and a plaster of Burgundy pitch, or a warming plaster, will occasionally afford much relief, if worn for a considerable time. Issues, setons, and pustulation with tartar emetic, though sometimes useful, produce, I think, as a general result, less good by revulsion than harm by irritation.

Bronchial Inflammation.—This almost constant accompaniment of phthisis requires particular attention, in the treatment of the disease. Allusion is here had not to the attacks of bronchitis which occur incidentally in the progress of the complaint, and may be seated in any portion of the lungs, but to the affection as it takes place in those bronchia only, which are in direct connection with the tuberculated structure, and is produced by the irritation of the tubercles, or by the matter discharged from them. This is a cause of much of the severe cough of consumption, and of much of that copious expectoration which is apt to attend the latter stages. It often no doubt tends to aggravate the febrile symptoms, and contributes materially towards exhausting the strength of the patient. In the early stages, it may be advantageously combated by small doses of *tartar emetic*, *ipecacuanha*, *sanguinaria*, or *lobelia*. It is probable that the alleviation which sometimes accrues, in the early period of phthisis, from the long-continued use of a very weak solution of tartar emetic in cold water as a common drink, depends chiefly upon its influence over the bronchial affection. For this purpose, it has been proposed to dissolve about one-sixth or one-eighth of a grain of the antimonial in at least a pint of water, which may be used at meals, or whenever the patient is thirsty. In a somewhat more advanced stage, when the expectoration begins to be opaque or purulent, squill or seneka, or both, may be added to the medicines above mentioned, or substituted for them. A very good mixture consists of equal measures of *syrup of squill* and *syrup of seneka*, and half the quantity of *antimonial* or *ipecacuanha wine*, and of the *solution of sulphate of morphia:* of which one or two fluidrachms may be given two, three, or four times in twenty-four hours. In the last stage of the disease, when suppuration is fully established, there may be advantage sometimes in resorting to the still more stimulating expectorants, as the *balsams*, *turpentines*, *copaiba*, *ammoniac*, *assafœtida*, and even *carbonate of ammonia*. Crea-

sote, *pyro-acetic spirit*, *tar-water*, and *petroleum* or *Barbadoes tar*, have also been used, with more or less success, to control excessive expectoration. The last-mentioned remedy is especially recommended by Dr. Theophilus Thompson. In the selection, reference must be had to other existing indications, such as that of nervous disorder calling for assafetida, and that of great general debility calling for ammoniacal remedies. The expectorants may often also, with great propriety, be combined with any tonic which may be employed. Thus, the *compound mixture of iron* of the Pharmacopœia, in which myrrh acts the part of the expectorant, is an excellent remedy in certain anemic cases with amenorrhœa, and without gastric inflammation. The narcotics which may be deemed advisable to counteract the cough, or allay nervous disorder, may also be given in connection with the expectorants.

Much benefit may be obtained, in reference to the bronchial inflammation, from certain inhalations; and it is probable that the greatly vaunted results of these remedies, in some cases of phthisis, have been owing more to their influence on the diseased mucous membrane than on the tubercles themselves, or their cavities. It is not impossible, however, that in cavities quite emptied of tuberculous matter, and not surrounded by tuberculous deposit, they may favour the healing process by a gently stimulant impression. They should be employed only in the second stage of the disease. As a general rule, the best mode of effecting inhalation is to impregnate with the volatile matter the air ordinarily breathed by the patient. When circumstances confine him to his chamber, he may thus be kept constantly under the remedial influence; and, at any rate, it may be made to act upon him through the night. This steady impression is much more effectual than a more powerful one made at certain intervals, while it will be less apt to irritate the lungs. When this mode of inhalation is impossible or inexpedient, some one of the instruments denominated inhalers may be resorted to. The particular substance which, within my observation, has appeared most effectual, applied in this way, is *tar vapour*. The air of a chamber may be conveniently impregnated with it by placing a little tar in a cup, which is to be immersed in water contained in another vessel, and heated by a spirit-lamp. The common nurse-lamp answers the purpose admirably well. The effects of a water-bath are thus obtained, and the igneous decomposition of the tar prevented. Neither with this, nor with any other vapour, should the air be so far loaded as to become at all oppressive when breathed. Other terebinthinate and balsamic vapours may be applied in the same way. Their use, to be effectual, must be persevered in for months, sometimes for years. It is probable that the advantage, which experience has shown to be occasionally derived from a residence in the midst of *pine forests*, is owing chiefly to the terebinthinate exhalation from the trees. The inhalation of *chlorine*, and of the *vapour of iodine*, has of late years been much praised. I have occasionally tried them both, but with little observable advantage. Nevertheless, others have found them useful, and I do not wish to discourage their employment. Great care is requisite to prevent them from irritating the lungs; and a mistake in this respect may lead to serious disadvantage. As respects chlorine, the best mode is to cause it to be gradually extricated into the atmosphere of the chamber from a vessel containing some chloride of lime, or one of the alkaline chlorides, into which some dilute acid may be made to fall drop by drop. Iodine should be applied by means of an inhaler. (See *U. S. Dispensatory.*)

For the treatment of the *laryngeal affection* which so frequently attends phthisis, the reader is referred to *chronic laryngitis*.

The *atomizer* will probably be brought into use, in the treatment of phthisis, for the introduction of liquids into the lungs by inhalation; but a sufficient number of facts has not yet been collected to justify any positive statements on the subject. (See *note*, vol. i. p. 949.)

Frequent Pulse.—The excessive frequency of pulse which constitutes so marked a feature of the disease, cannot but react injuriously on the system, and even on the lungs themselves, and should, therefore, be controlled if possible. Wild-cherry bark, already recommended for another purpose, often serves in some degree to fulfil this indication. In the absence of this medicine, hydrocyanic acid may be tried alone. But the most effectual remedy for restraining the frequency of the pulse, when not dependent on inflammation, is probably *digitalis;* and this is the chief advantage to be expected from that once highly praised narcotic. Sometimes it acts most happily and speedily; but not unfrequently it either fails, or, while it depresses the pulse, depresses also injuriously the general strength. The late Prof. Chapman made the following statement in relation to this remedy. "As the result of no slender experience with digitalis, I am prepared to state, that the only case of phthisis in which it can be much relied on, is the incipient stage, usually attended with a slight hæmoptoe, small, quick, irritated pulse, extreme mobility of system, short impeded respiration, and hard, dry, diminutive cough, where venesection and other evacuant means are precluded." (*Dis. of Thorac. and Abdom. Viscera,* p. 60.) It is probable that *cimicifuga,* which has been long popularly employed in consumption, in this country, and has been highly recommended by Dr. F. J. Garden, of Virginia (*Am. Med. Recorder,* Oct. 1828), and Dr. C. C. Hildreth, of Ohio (*Am. Journ. of Med. Sci.,* N. S., iv. 281), owes its beneficial effects, in part at least, to a sedative influence over the circulation. Dr. Hildreth found it peculiarly advantageous in the early stages, combined with iodine. *Veratrum viride* might sometimes prove useful in the same way.

Night-sweats and Hectic Fever.—A vast variety of means have been recommended for the relief of these affections, and all of them too frequently without any permanent advantage. For the colliquative sweats, which, in consequence of their exhausting as well as very disagreeable effects, it is highly desirable to be able to control, nothing is probably, on the whole, more useful than the mineral acids, and especially the sulphuric, which is usually employed in the form of *elixir of vitriol,* or the *aromatic sulphuric acid* of the Pharmacopœia. From five to fifteen drops of this preparation may be administered, in a wineglassful or more of cold water, or some bitter infusion, three or four times a day, or more frequently. *Nitric* or *nitromuriatic acid* may be substituted, if more acceptable to the palate or stomach. Various other internal remedies have been recommended. Among them are *acetate of lead, alum, tincture of chloride of iron, prepared chalk or lime-water,* and the *vegetable astringents,* of which pure *tannic acid* is probably the most efficient. *Gallic acid,* however, has been very highly commended. Much was said a few years since of the extraordinary efficacy of *oxide of zinc* in controlling the night-sweats of phthisis, given at bedtime in the dose of four grains or more, with a little extract of hyoscyamus. *Dover's powder* may sometimes prove useful, by substituting its own active, but less copious diaphoresis, for the passive one of the disease. The prominent indication would seem to be to stimulate the skin moderately but universally; and this indication is met by a *hot* bath, rendered more excitant by the addition of common salt, or a little mustard or Cayenne pepper. Friction to the surface with a solution of alum in hot brandy, in the proportion of two drachms to a pint, is highly recommended; but the fact is, that the spirit is the chief agent, as little if any of the alum is dissolved. The flesh-brush, or friction with coarse flannel, is also sometimes useful. The patient should always sleep in flannel, which should, however, be very light in summer. It is said that sponging the body, at bedtime, with warm water, or warm vinegar, sometimes proves serviceable.

For the hectic paroxysms, no remedy is so effectual as sulphate of quinia, which, given to the extent of ten or twelve grains in the intervals, will often set aside the chills, though they are very apt to return. It is obvious that nothing can permanently arrest them while the cause remains; and it is not only futile, but injurious, by endangering the healthy state of the stomach, to load this viscus with that great variety of drugs which have been recommended for this affection. One of the least injurious is *vinegar*, of which one or two teaspoonfuls may be given every hour or two, sufficiently diluted with water, and sweetened. Griffith's *antihectic myrrh mixture* (*Mist. Ferri Comp.*, U. S. Ph.) may be tried, when the stomach is not irritated or inflamed. When the chills occur regularly, and are very distressing, they may frequently be prevented by anticipating them with a full dose of opium. During the fever, the patient may often be much relieved by small doses of the *neutral mixture*, or *effervescing draught*, or *citrate of ammonia*, with or without a little *spirit of nitrous ether* and *solution of sulphate of morphia*. Sponging the surface with warm vinegar or spirit sometimes has a soothing effect.

Vomiting and Diarrhœa.—When the nausea or vomiting is attended with tenderness at the pit of the stomach, indicating gastritis, a few leeches may be applied, followed by emollients and blisters. If there is considerable fever, the patient should be confined for a time to demulcent or farinaceous drinks. When the general and local excitement is less, advantage will sometimes accrue from an exclusive diet of lime-water and milk, with stale bread or crackers; but it often happens that the debility is too great to admit of this exclusiveness, and something more nutritious is necessary. The ordinary remedies for vomiting may be tried, such as the effervescing draught, when there is fever, and carbonic acid water, creasote, &c., under other circumstances. (See *Vomiting, vol.* i. *page* 679.) Nitrate of silver, with a little opium, is likely to prove the most efficacious remedy, when there is reason to believe that the mucous membrane is ulcerated. For the diarrhœa, opiates, chalk, the various astringents, and a milk diet may be used as palliatives; but, when it is considered that the affection generally depends upon tubercles in the bowels, little permanent good will be expected from any remedy. Dr. Theophilus Thompson, of London, recommends strongly subnitrate of bismuth, in the dose of five grains, three times a day. (*Lond. Med. Gaz.*, July 14, 1848.) M. Monneret employs the same remedy, in a quantity varying from two to twenty drachms in the course of a day, and declares that he has never observed the slightest inconvenience from these large doses, even in children. (*Am. Journ. of Med. Sci.*, N. S., xviii. 468.) A mixture consisting of ten grains of the subnitrate and three minims of officinal hydrocyanic acid, made into a draught with mucilage and mint-water, taken thrice daily, has proved peculiarly efficacious. (*Lond. Med. Times and Gaz.*, Dec. 1854, p. 614.) Charcoal is said to be sometimes useful, its operation being ascribed to the absorption of acrid matters in the bowels. Dr. Physick once told the author, that he had found nothing so efficacious in the diarrhœa of phthisis as a diet exclusively of milk.

The *great debility* of the last stage requires attention. One of the main objects in the treatment of this condition, is to impart sufficient muscular power to the patient to enable him to expectorate the secretions, which often accumulate in the bronchia, and, if not discharged, must produce suffocation. Carbonate of ammonia, wine-whey, milk-punch, and egg with wine, may be used. Life may sometimes be considerably protracted by these means.

Lastly, it is often necessary, in the final stage, to protect the prominent points of the body, especially the hips, sacrum, and shoulders, by means of spirituous lotions, the lead plaster, down pillows, and circular pillows with an opening in the centre, from the inflammation, sloughing, and ulceration which are so apt to ensue from friction and pressure, in cases of great emaciation, and long confinement to bed. Dr. Purefoy states that he has effectually prevented these unpleasant results, by placing underneath the parts liable to injury a beef's bladder, oiled and partially filled with air. (See *Journ. de Pharm. et de Chim.*, xiii. 121.)

The plan of treatment above detailed is that which the author believes best adapted to the alleviation, and, when this is possible, to the cure of the disease. But numerous plans and remedies, not here mentioned, have been proposed at different times, many of them with the claims of a specific, and all with the support of asserted cures. Each, when announced, has been received with more or less confidence by an eager public, to be in its turn abandoned after a trial of longer or shorter duration; and every now and then one of them is revived to run again a brief career of experiment, failure, and neglect. To enumerate and discuss all these plans and remedies in this place, would be incompatible with the purposes of the work. It will be sufficient to notice some of the more prominent or more recent among them. The frequent use of *emetics*, in the early stages, has been very strongly recommended. They have been given daily, or every other day, and continued for months. Different articles of the class have been employed by different practitioners, some preferring tartar emetic, others ipecacuanha, sulphate of zinc, or sulphate of copper. *Residence in a miasmatic district* has been proposed, upon the grounds that the disease is much less frequent in such districts than in others of the same temperature, and that the occurrence of miasmatic fever sometimes supersedes phthisis. But these are very doubtful points, and the remedy is too hazardous for trial without more certain proof of its efficiency. Tanners are said to be remarkably exempt from the disease; and, this exemption having been ascribed to the *exhalations from the oak bark* employed in their business, attempts have been made to derive therapeutical effects from similar exhalations, by placing the material affording them in the sleeping apartment of the patient. The extravagant practice has even had its advocates, of causing patients to breathe habitually the air of stables in which cows are kept, because *the breath of these animals* has been supposed to exercise a favourable influence over the disease. Among the inhalations which have been employed, at various times, besides those already mentioned, are *oxygen gas, carburetted hydrogen, carbonic acid from burning charcoal*, the *vapours from copaiba and storax, hydriodic ether* or *iodide of ethyl* (see *U. S. Dispensatory*), and air loaded with certain powders, such as *myrrh*, for example. It has even been proposed by Dr. Green, of New York, to inject a strong solution of nitrate of silver into the air-passages, by means of a tube passed through the larynx, with a view to change the character of the disease in the tuberculous cavities; and the attempt has been made, in some instances, to carry this proposition into effect; but there is reason to believe that, at least in the greater number of these instances, the injection has fortunately passed into the alimentary canal instead of the lungs. (See *N. York Med. Times*, July, 1855, iv. 350.) *Digitalis* and *hydrocyanic acid* have fallen from the rank of specifics, which many were at first disposed to give them, into that of mere palliatives of some of the symptoms. *Naphtha* and *common salt* have been more recently recommended, but with even less success. *Sulphurous baths*, and the use of *sulphurous waters* internally, have been supposed to have a specific curative influence. *Alcoholic lotions* to the chest are said by Dr. Marshall Hall to be among the most efficacious means of checking the deposition and softening of tubercles. (See *Am. Journ. of Med. Sci.*, N. S., viii. 218.) *Phosphate of lime* alone, or in combination with other phosphates, as those of soda, iron, &c., has been considerably used; but experience has not decided in its favour. In a paper read before the French Academy of Medicine, Dr. Churchill claimed great efficiency, in the treatment of phthisis, for the *hypophosphites of soda and lime*, given in quantities varying from eight to forty grains through the day, the medium quantity being fifteen grains daily, or five grains three times a day, for an adult. He supposes the remedy to act by supplying the deficiency of phosphorus, which he conceives to be the chief cause of tuberculous disease. (*Arch. Gén.*, Sept. 1857, p. 357.) Dr. R. P. Cotton, of the Brompton Hospital for Consumption, has given a fair trial to this assumed remedy, and found that out of twenty patients in whom it was used, there were only two in whom any real benefit was experienced. He considers it, on the whole, as useless in the disease. (*Med. Times and Gaz.*, Feb. 1858, p. 163.) Dr. Simpson, of Edinburgh, has suggested the external use of oil, on the ground that persons engaged in wool factories, whose skins are always greasy with the oil employed, are remarkably exempt from phthisis; and his views on this subject are strongly enforced by Mr. J. B. Thomson, of Perth, who, with ample opportunities of observation, states that the workers in wool factories are far more healthy than those engaged in the manufacture of cotton; and, moreover, that they who are concerned in the most oily of the processes in the former are the most exempt from disease. (*Edin. Med. Journ.*, June, 1858, p. 1083.) *Compression of the chest*, and even the operation of *paracentesis*, in order to induce collapse of the diseased lung, have been suggested, but are not likely to be adopted. *Glycerin* was proposed by Dr. Crawcour, of New Orleans, as a substitute for cod-liver oil; but, though some reports have been made in its favour, it does not appear to have gained the confidence of the profession generally. It is given in doses varying from one to four fluidrachms three times a day. Dr. D. H. Storer, of Boston, has found advantage from *fusel oil*, given in doses of four drops, increased to six, after each meal. (*Va. Med. and Surg. Journ.*, iv. 414.) *Arsenic* has been employed by Dr. Arthur Leared, of London, who infers from his experience that, though it may possibly be useful in the early stages, by its influence on the system, yet it is very apt to disturb the digestion, and on the whole is of equivocal value. (*Med. T. and Gaz.*, Jan. 1863, p. 61.) The same practitioner speaks encouragingly of the effects of the *hot-air bath*, taken two or three times a week, and followed by a plunge into a cold bath, in the Turkish fashion. (*Lancet*, Nov. 1863, p. 587.) Dr. Parola considers *ergot* as extremely useful in obviating the pulmonary inflammation which attends phthisis; and his opinion is supported by the approval of the Academy of Turin. (*Am. J. of Pharm.*, July, 1858, p. 374.) *Carbolic* or *phenic acid* has been much used of late in France, on the recommendation of Prof. Longet, who had been greatly benefited by it in his own case. A solution of fifteen drops of the pure acid in two fluidrachms of alcohol is mixed with thirty-two fluidounces of water; and the whole of this quantity is administered daily, partly by the stomach, and partly through the lungs by inhalation in the pulverized or atomized state. (*Med. T. and Gaz.*, Nov. 1865, p. 573.) *Chlorate of potassa*, which had been used in phthisis with the view of improving the blood, has been recently tried in a number of cases in the Brompton Hospital by Dr. R. Payne Cotton; who states of it that, though without specific action on the disease, and of questionable utility as a remedy generally, it may do good in certain cachectic conditions occasionally attendant on consumption. (*Ibid.*, May, 1862, p. 531.) Among the new remedies for phthisis it may be proper to allude to *raw meat and alcohol*, introduced into notice by M. Fuster, of Montpellier, who has used it largely in the hospital under his charge, without, however, neglecting other means, and found great advantage from it. He gives at first daily 100 grammes (1543 grains) of raw beef or mutton reduced to a soft pulp and enveloped in sugar, and the same quantity of diluted alcohol (*U. S. Ph.*), mixed with two or three times its weight of water, and flavoured with syrup of orange flowers. (*Ibid.*, Oct. 1865, p. 396.) It may be doubted whether the rawness of the flesh adds anything to the efficacy of the alcohol, which is sometimes very useful in the advanced stage of the disease.

3. ***Prophylactic Treatment.***—It is of the utmost importance, in cases of a

supposed tendency to consumption, to prevent the establishment of the diathesis. For this purpose, all those measures, already treated of as applicable to the prevention of tuberculous deposition, should be brought to bear upon the case. The great object should be to impart vigour of constitution. There is no greater mistake, though it is one often made by anxious parents, than to bring up a child with a consumptive tendency, in a peculiarly delicate manner, and to give him a trade or occupation which requires little exposure or bodily exertion. Exactly the opposite course should be pursued. The business of a farmer, carpenter, seaman, engineer, &c., is greatly preferable, for such a person, to one of the sedentary trades or professions. An infant should never be allowed to derive its nourishment from the breast of a consumptive or scrofulous nurse. The frequent use of the cold bath, and frictions to the surface, will often serve a useful purpose in giving strength; and the former is more applicable as a prophylactic than a remedy, because the system is more likely to react efficiently before than after the development of the consumptive diathesis. It should be remembered, in the use of the cold bath, that, unless followed by prompt reaction, it will be likely to do more harm than good. Above all things, in guarding against consumption, we should insist on the necessity of vigorous exercise in the open air.

Article VIII.

VARIOUS ORGANIC AFFECTIONS OF THE LUNGS.

The lungs are liable to various organic affections, besides those already described. Their rarity, however, the obscurity of their diagnosis, and the total inefficacy of treatment render a minute account of most of them inexpedient in a treatise like the present. It is scarcely necessary to call attention to the occasional existence of *tumours in the air-passages*, which, if they ever occur in the interior of the lungs, can seldom be recognized with an approach to certainty during life. *Aneurisms* of the great vessels within the chest, though they often very much interfere with the function of respiration, belong properly to diseases of the circulatory apparatus. (See *Aneurisms*.) As all other structures, the lungs are liable to be atrophied or hypertrophied. These conditions, however, are very rare, uncomplicated with other diseases. M. Woillez refers to a case of hypertrophy, the only one he ever witnessed, which was characterized during life by very decided weakness of the respiratory murmur, explained by the great diminution of the air-space in the lung, through the increased volume of the tissue, compressed as it was by the walls of the chest. But other morbid respiratory sounds might be expected in similar cases, as the sibilant and sonorous rales, and rude respiration, consequent on a narrowing of the passages. (*Arch. Gén.*, Août, 1865, p. 169.)

Foreign bodies, accidentally introduced through the larynx, sometimes lodge in the bronchia, and give rise to very serious symptoms, which, however, may all be referred to obstruction more or less complete of the air-passages, and to inflammation of these passages, or of the substance of the lungs. Death may result very speedily from obstruction, in the course of a few days from inflammation, or after months or years of suffering from cough, dyspnœa, pains in the chest, purulent expectoration, and hectic fever. Cases have occurred in which, after many years, the patient has coughed up the offending substance, and been restored to health. In some instances, the body is movable, and rises occasionally into the trachea or larynx, producing violent paroxysms of cough and dyspnœa. In such cases, there may be good hope of affording relief by the operation of tracheotomy.

Calcareous, cartilaginous, and bony tumours are sometimes found in the lungs after death, chiefly in old persons, and most frequently in the upper portion of the organ. They are usually small, and during life seldom occasion symptoms which give rise to the suspicion of their existence. Occasionally, they may excite a little inflammation of the neighbouring pulmonary tissue, and they have been known to cause a slight dyspnœa by pressure on the bronchia. There is reason to suppose that, in some instances at least, they are the remains of tubercles which have undergone absorption.

SEROUS CYSTS AND HYDATIDS have been observed in some very rare instances. The latter have been known to attain great magnitude, and to interfere much with the functions of the lungs. I have in my possession an hydatid cyst of enormous size, which projected from the upper surface of the liver high into the lungs, and was mistaken during life for pleuritic effusion. Sometimes small cysts or fragments of cysts, supposed to be of hydatid origin, have been coughed up, thus revealing the existence of the affection; but in general it is extremely obscure, and is seldom observed before death. In some cases, however, when the tumour has attained a great magnitude, it may be diagnosticated with considerable certainty. Such a case came under the notice of Dr. Vigla, of Paris, who not only detected its nature, but succeeded in effecting a cure. M. Vigla gives the following diagnostic characters, which serve to distinguish the affection from pleurisy, with which it is most liable to be confounded:—constant pain in the part affected; dyspnœa steadily increasing, and ending finally in death from asphyxia, unless anticipated by a supervening disease; an unequal expansion of the chest, with a partial convexity quite different from what is seen in pleurisy; flatness on percussion, extending around some spot in the chest, not from below upwards, without regular level, and sometimes stretching over to a point in the opposite side; a development independently of the law of gravitation; the absence, as a general rule, of all respiratory sounds, as well as of bronchophony and ægophony; the remarkable want of constitutional symptoms; and, finally, an origin so gradual as to escape notice, a chronic condition throughout, slow progress, and long duration. These characters would justify strong suspicions of a large hydatid, but are not absolutely diagnostic; as a solid tumour might offer the same phenomena. This point may be tested by the insertion of a grooved needle. If a liquid escape, colourless and transparent, without reaction on test paper, not becoming turbid with nitric acid or heat, and especially if with this liquid there should be pieces of delicate and transparent membrane, the proof of the hydatid nature of the affection would be complete. In such a case, M. Vigla, after evacuating the liquid, injected about eight fluidounces of a mixture containing 1 part of iodine, 1 of iodide of potassium, 10 of alcohol, and 30 of distilled water. In 37 days after the operation, the patient was discharged from the hospital, able to attend to his duties, and ultimately was quite restored to health. (*Arch. Gén.*, *Sept.* and *Nov.* 1855, pp. 280 and 523.)

MALIGNANT TUMOURS occur in the lungs as elsewhere. Genuine *scirrhus* is exceedingly rare; but the *medullary* or *encephaloid* disease is not very uncommon, and *melanosis* is now and then observed. *Fibro-plastic disease* has also been found. These affections exist either in the form of encysted or non-encysted tumours, or of infiltration into the pulmonary tissue. They appear sometimes to undergo the process of softening and partial discharge, thus giving rise to cavities of greater or less magnitude. But they are much less apt to run this particular course than tubercles. Being usually slow in their progress, they give rise at first to few prominent symptoms. A little cough and oppression in breathing are perhaps all that attract attention. These increase, and are after a time attended with pains more or less severe, and at length with constitutional symptoms, such as a frequent pulse, emaciation, the sallow complexion of cancerous disease, and dropsical effusion. There is, however, usually, less fever than in phthisis. Hæmoptysis is not unfrequent. The breath in the advanced stage is often fetid; and, in the cases in which softening occurs, the morbid matter is sometimes visible in the puruloid expectoration, which, in the medullary cancer, may be streaked with red and white, and in melanosis may be occasionally black. The signs afforded by percussion and auscultation are such as indicate consolidation of the lungs, and sometimes those of a cavity. The diagnosis between these affections and phthisis is often only probable. The constant flatness on percussion over the affected part, the total absence of the healthy respiratory murmur, and the tubal or tracheal respiration without rales, are mentioned by Valleix among the diagnostic characters. The occurrence of external tumefaction and hardness of the areolar tissue on the chest, neck, or arm, connected with the above signs, would tend to confirm the diagnosis. It would indicate the probable coagulation of the blood in one or more of the great venous trunks, consequent upon the cancerous disease. A case of this kind occurred to me, in which the whole upper portion of the chest and the right arm were enormously swollen and hardened, presenting characters not unlike those of phlegmasia dolens. Sometimes the tumour presses on the blood-vessels, respiratory passages, or œsophagus, producing various derangements, such as are not occasioned by pulmonary tubercle. In cases of cancerous infiltration of the lung, this organ is usually contracted, and the side of the chest is flattened, with slight depression of the intercostal spaces. But the most certain evidence of the disease is afforded by the existence of a corresponding affection in other parts of the body. When pectoral symptoms of a consumptive character supervene upon external cancer or melanosis, there is reason to suspect that the same disease exists in the lungs; and the suspicion would be strengthened, should the breath be fetid, and the patient wear away with comparatively little fever. The treatment is purely palliative, and confined chiefly to the use of narcotics.

CIRRHOSIS OF THE LUNGS is an affection which merits special notice. Originally confounded with chronic inflammation of the organ, it was first recognized as a peculiar affection by Dr. Corrigan, of Dublin, who gave it the name at the head of this paragraph, from its resemblance to the disease known as cirrhosis of the liver. It consists, probably, in a fibroid degeneration of the areolar tissue of the lungs, which is replaced by a white, shining, hard tissue, having the property of strongly contracting after exudation and organization. It will be most convenient to give first the anatomical characters, and afterwards the symptomatology of the disease.

The whole or a part only of the lung may be affected. The diseased lung is firm and greatly shrunk, and its place supplied by the presence of the opposite lung, the heart, and the abdominal viscera, which are pressed into the affected side of the chest, while the thoracic wall on the same side is also much depressed and flattened. When the diseased lung is divided, a white, tough, fibroid matter, creaking when cut, is seen infiltrated into the areolar tissue, and especially into the interlobular spaces; the spongy structure of the lung has wholly disappeared; and cavities sometimes of considerable size are seen, which seem as if excavated out of the solid mass, but are in fact dilated bronchial tubes, as appears from a close examination of their structure. Besides the proper disease, there are usually also found pleuritic adhesions, and various evidences of congestion or inflammation of the sound lung.

The symptoms are cough, expectoration more or less copious of a mucous or muco-purulent, and often fetid matter, occasional hemorrhage, frequent pulse, emaciation, and at length slight hectic symptoms; though the constitutional disturbance is much less than might be expected from the local phenomena, and the march of the disease is very slow, sometimes lasting for several years. Indeed, the most prominent symptoms, and the ultimate fatal issue, are more due to disordered condition in the unaffected lung, either accidental, or induced by the excess of duty thrown upon it, than to the immediate disease. The physical signs are, on inspection, retracted chest, depression of the intercostal spaces, and displacement of the heart towards the affected side; on percussion, flatness with wood-like resistance immediately over the affected part, not unfrequently a tubular sound, arising from the dilated bronchia, and sometimes the cracked-metal sound, with exaggerated resonance elsewhere; upon auscultation, absence of the respiratory murmur over the diseased lung, increased murmur over the sound one, bronchial, cavernous, or amphoric respiration, bronchophony, and sometimes pectoriloquy; in short, all the characters of solidified lung with cavities.

The affections with which this is most likely to be confounded are phthisis, and chronic pleurisy after absorption of the liquid effusion. From the first it is distinguished by its comparatively slow progress, the relatively slight constitutional disturbance, the almost entire absence of hectic, the limitation of the disease to one lung, the predominance of the signs of solidification over those of softening, and the greater retraction of the chest, and displacement of the heart and abdominal viscera. Cirrhosis of the lung bears considerable resemblance to chronic pleurisy after absorption, in the retraction of the chest and the displacement of the heart and other organs; but differs in its greater amount of constitutional disturbance, the more decided evidences of pulmonary solidification and cavities, and the want of the outward tilting of the scapula, and of the twisting of the ribs inwards and downwards. (Walshe, *Med. Times and Gaz.*, Feb. 1856, p. 158.) It also differs in the general course of the disease, which is quite unlike that of pleurisy.

The cause of the obliteration of the air-cells is probably the pressure of the substance infiltrated into the areolar tissue around them; that of the dilatation of the bronchia, the contraction of that substance, and the general diminution of the capacity of the lung, whereby the expanding power of inspiration is exerted mainly on these tubes. The march of the disease is inevitably to a fatal issue, although in general very slowly. As death takes place rather by congestion and inflammation of the parts of the lung not cirrhosed, or their consequences, than directly through the cirrhosis itself, it follows that our efforts should be mainly directed to the correction of these conditions, when they become obvious, and to obviating their exhausting effects in the advanced stages by duly supporting the general strength. It is possible also that, by employing measures calculated to maintain a sound and healthy assimilation and nutrition, we may in some measure obviate the tendency to the fibroid degeneration.*

Spurious Melanosis is the name given to an affection, described by recent English writers, as occurring in persons long confined to a smoky atmosphere, or to one loaded with coal dust. It is especially frequent among the workers in coal-mines, so much so, indeed, as to have received the name of *miners' lung*. A black carbonaceous matter, wholly distinct in nature from the black matter of true melanosis, is found dispersed through the substance of the lungs. The patients exhibit during life the ordinary symptoms of pulmonary disease, with the expectoration of a black matter, by which the affection is characterized. After death, the lungs are found to be variously disorganized, exhibiting in some parts black hepatization, in others cavities containing an inky black fluid, and in others again an edematous condition with a serous fluid, which is also black. Even the sound parts of the lungs may present the same black colour. There seems to be no doubt that this is owing to carbonaceous matter derived from without, which, finding an entrance into the substance of the lungs, resists absorption on account of its insolubility, and remains unless discharged by the disorganization of the pulmonary tissue. The question is, how the black matter makes its way into this tissue. The most probable explanation is, that it enters through lesions already existing, and that the disorganization is less the effect of the carbonaceous matter than of previous organic disease. It is possible that, once admitted, it may act as an irritant, and extend the inflammatory and ulcerative processes. The matter is capable of penetrating the epithelial cells, for it has been observed between their walls and the contained nuclei, by examination under the microscope. (*Ed. Month. Journ.*, Sept. 1851, p. 265.) Virchow, however, is disposed to think that the disease is only an example of pigmentary change; blood being effused in consequence of irritation, and the hæmatin undergoing transformation into black pigment. (*Ed. Med. Journ.*, Sept. 1858, p. 204.) The most important point in the treatment is to remove the patient into a better atmosphere. In a pure air, the symptoms are ameliorated; and, if not affected with an incurable organic lesion, independently of the foreign matter, the patient may recover.

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* An interesting case is recorded by Mr. Robert Mayne, of Dublin, in which a patient, afflicted at an early period with tuberculous disease of the lungs, from the constitutional effects of which he had recovered, with evidences of a cavity in the left lung remaining, was affected with symptoms of cirrhosis of the left lung, presenting all the characteristic features of that disease as stated in the text. His general health, however, does not seem to have been impaired, after recovery from the effects of phthisis, until he was attacked, through inclemency of the weather, by acute bronchitis of the sound lung, by which he was carried off. On examination, a large cavity was found, having all the characters of an old tuberculous excavation, with an artery running across it, bronchial tubes running into it, and a lining of dense tissue such as Laennec describes as sometimes occurring in old tuberculous cavities. No tubercles were remaining, and the rest of the lung was in a state of cirrhosis. It is an interesting question whether in this case the cirrhosis may not have supplanted the tuberculous disease. (*Dub. Hosp. Gaz.*, Feb. 1, 1860, p. 33.)—*Note to the sixth edition.*

The BRONCHIAL GLANDS not unfrequently become diseased, being sometimes merely enlarged by chronic inflammation, sometimes loaded with tuberculous deposit, and sometimes again affected with medullary, melanotic, or other malignant degeneration. Of these conditions, the tuberculous, which is the most common, is elsewhere specially treated of. The symptoms produced by the enlargement of these glands, are chiefly such as result from pressure on the bronchial tubes and great blood-vessels. Its existence may be suspected when, in connection with such symptoms, there is dulness on percussion at the top of the sternum, without the characteristic signs of aneurismal tumours, and especially when the cervical or axillary glands are swollen. The nature of the affection must be inferred from the character of disease existing elsewhere, and the state of the constitution. When the complaint is not tuberculous or malignant, good effects may be expected from local depletion, revulsion by blisters, &c., and the general and local use of iodine or mercury.

SUBSECTION IV.

FUNCTIONAL DISEASE OF THE PULMONARY TISSUE.

Article I.

LOSS OF BREATH, APNŒA, OR ASPHYXIA.

A SUSPENSION of the respiratory process is usually designated by the very inappropriate name of *asphyxia*, which literally signifies *want of pulse*. I prefer the term *apnœa*, employed by Dr. Watson, as at least equally euphonious, and of an origin corresponding with its application.

The real pathological condition, in this affection, is a retardation or stoppage of the circulation through the pulmonary capillaries. The blood, arrested in the lungs, ceases to reach the heart in quantities sufficient to support the actions of that organ, and the phenomena of life are suspended. In order that the blood may pass from the pulmonary arteries into the pulmonary veins, it must change from venous to arterial. The capillaries will not convey black or unarterialized blood in quantities sufficient to maintain the contractions of the heart. Why this is so must be left to the physiologists to determine. The fact has been sufficiently established by the experiments of Drs. Williams and Kay. Any cause, therefore, which prevents the arterialization of the blood, will arrest the pulmonary circulation, and give rise to the phenomena of apnœa or asphyxia. It is not at all impossible, that there may also be a condition of the pulmonary capillaries themselves, altogether independent of this change of the blood, which may disable them from performing their functions duly. Such a condition is often observed in the external capillaries. When these approach to a loss of their vitality, or quite lose it, the blood flows through them more slowly, or ceases to flow altogether. The pulmonary capillaries may in like manner become as it were palsied, and no longer contribute their share towards the conveyance of the blood. But we are too little acquainted with the nature of this possible disease of the pulmonary capillaries to make it a subject of discussion. So far as the actions of these vessels can be positively traced, they cease to convey the blood because this is not duly changed.

The consequences of this diminution or cessation of the circulation in the pulmonary capillaries are of two kinds. In the *first* place, the blood reaches the left cavities of the heart in gradually decreasing quantities, until it becomes insufficient to stimulate them to contraction; and we have all the results of a failure of the general circulation. *Secondly,* as there is a necessary accumulation of blood behind the place of obstruction, congestion takes place in the pulmonary arteries, the right cavities of the heart, the great venous trunks, and the larger viscera, as the brain, liver, spleen, stomach, and intestines; and the phenomena of venous engorgement are everywhere exhibited. With these two sets of morbid effects, a *third* is often more or less mingled, arising not directly from the suspension of the pulmonary circulation, but from the unchanged or insufficiently changed venous blood, which finds its way, though in gradually diminishing quantities, into the heart, and thence into the arterial system generally. It is highly probable that the presence of this bad blood in the nutritive vessels of the heart itself may tend to impair its powers; and some of the cerebral phenomena may depend upon the same injurious influence in the vessels of the brain.

In tracing the chain of morbid actions from the incipient link in the capillary vessels, we come next to the encephalon. The nervous centres suffer both from a deficient supply of arterial blood, consequent upon the diminished action of the left ventricle, and from venous congestion. They become, therefore, incapable of performing their functions, whether in the reception of impressions, or the transmission of nervous influence. The sensation of breathlessness, at first painfully excited by the failure of the proper respiratory function, ceases to be felt; and the muscles of respiration, at first often tumultuously agitated by the stimulus from the troubled brain, now become powerless from an utter want of that stimulus. The patient, therefore, ceases to make any respiratory effort; and the original failure in the capillary circulation of the lungs, if before only partial, now becomes complete. The heart no longer receives the partial supply of blood, which, for a time, sustained its decreasing actions, and ceases to beat altogether. It is probable that this loss of motion in the heart depends upon the want of blood in its own peculiar arteries, quite as much as upon the same deficiency in its left cavities; for both sides of the heart cease to act simultaneously, though the right cavities are filled with blood. It has been supposed that the distension of the right cavities might be the cause of their suspended motion, by paralysing the muscular fibres; but if this were the sole cause, the opposite sides of the heart would scarcely stop at the same moment. The influence under which the whole organ becomes quiescent at once, must affect the whole of it equally; and such an influence can be exerted, so far as the supply of blood is concerned, only through the coronary arteries. It appears, then, that the heart is the last organ to die, in true and uncomplicated apnœa. Observation has proved that this organ even retains its contractility for a considerable time after its motions have ceased, and will resume its actions if the necessary stimulus be afforded.

But there are many cases of apnœa in which the starting-point of the disease is in the nervous centre of respiration, or in the conductors by which that centre communicates with the organs which it controls. The affection, in such cases, is obviously complicated. The precise mode in which cerebral disease, involving the medulla oblongata, which is the centre of respiration, gives rise to the phenomena of asphyxia, has not been absolutely determined in all instances. There can be no doubt that it often acts by paralyzing the muscles of respiration, so as to render the expansion of the chest, and consequently the entrance of fresh air into the lungs impossible; and some maintain that this is the only mode in which it can act. But we occasionally meet with cases in which, though the muscular movements of respiration are fully performed, and air is admitted freely into the lungs, symptoms closely analogous to those of apnœa are exhibited, apparently dependent on a want of nervous power. This condition of things is sometimes presented in pernicious fevers, and other diseases characterized by great nervous prostration. It is not at all improbable that, in such cases, the pulmonary capillaries cease to convey the blood in consequence of some modification of their nervous condition not well understood; and it is possible that a similar modification, with similar results, may sometimes arise from the causes which tend to weaken or paralyze the muscles; so that the two influences may be exerted conjointly, and with a greater effect than would flow from either alone.

Symptoms.—These vary essentially according to the state of the nervous centre, or that of the nerves connecting it with the respiratory apparatus. When these are not primarily involved, the most prominent symptom is at first a distressing sense of the want of breath, consequent upon the presence of unchanged venous blood in the capillaries of the lungs, and probably also, in some degree, of an insufficient supply of blood to the capillaries of the system generally. This sensation, which is the provision of nature for calling from the nervous centres a supply of energy to the respiratory movements, adequate to the increased wants of the system, becomes, in the present instance, the source of greatly increased efforts, both voluntary and involuntary, for the supply of air to the lungs. Along, therefore, with great anxiety of countenance, and an intense expression of distress, there is quick and violent movement of all the muscles of respiration capable of action. The chest heaves, the shoulders are elevated, the alæ nasi are dilated, and the patient, panting or gasping for breath, throws himself about convulsively, or seizes with a spasmodic grasp upon objects in his neighbourhood. But, when the affection is severe and acute, these symptoms do not last long. The brain soon becomes involved, and a feeling of vertigo is speedily followed by stupor and insensibility, not unfrequently attended with convulsions. Respiration now ceases to be in any degree under the influence of the will, and the movements which continue are involuntary and irregular. At the same time, signs of venous accumulation are presented in the livid hue of the face, the dark-purple colour of the lips, the distended veins, and the prominent eyes. Involuntary discharges take place, from relaxation of the sphincters. The pulse gradually becomes weaker, but is still distinct. The involuntary movements of respiration now cease, and the patient breathes no more. The whole surface of the body exhibits a somewhat livid paleness, the feet and hands are purple, and purple patches are often seen on various parts of the body. At last, the pulse at the wrist stops, though the heart continues to beat feebly for a short time after all external signs of life have ceased. Nor, even when this pulsates no longer, is death absolute. Vitality still lingers for an uncertain period, prepared to respond to efforts of resuscitation; and a restoration of the respiratory process by artificial means has often revived the patient, when not a vital movement in any portion of the body could be detected.

The degree to which the pulmonary circulation is suspended has a great influence over the phenomena. If the suspension is complete, the struggle is speedily over; and sometimes the impression upon the brain is so quickly produced, that the patient experiences scarcely any suffering. Respiration, under such circumstances, usually ceases in a period varying from somewhat less than two to five minutes, and the circulation in about ten minutes; but there is in this respect much difference in individuals, and habit has a great influence. Divers in the pearl fishery, for example, can do without air much longer than others not accustomed to remain under water. When the obstruction to the pulmonary circulation is only partial, the suffering is more or less protracted; and the patient may be tortured with excessive dyspnœa for days or weeks, nay even for months, before sinking into complete apnœa. This is, indeed, among the most painful symptoms of various diseases which impede the due aeration of the blood. The sensation of want of breath is, in such cases, not unfrequently referred to the præcordia, when the real cause exists at some distant point. In these protracted cases, death often results as much from a gradual failure of all parts of the system, under a deficient supply of imperfectly arterialized blood, as from the direct influence of suspended respiration.

When the cause of the pulmonary affection resides in the nervous centre, or in the nerves of respiration, the symptoms may be in some respects very different from those above enumerated. Insensibility of the medulla oblongata, or imperfection in the afferent nerves, prevents the perception of the want of respiration, which is the essential stimulus to this function; and the individual ceases to breathe, without previous suffering, and of course without those struggles for breath which usually precede death from apnœa. Should the imperfection exist only in the afferent nerves, the brain and efferent nerves remaining sound, respiration might be supported for a time under the suggestion of the intellect, and by the effort of the will, but it would be immediately interrupted by sleep. Practically, however, we very seldom meet with such a case.* When the defect is in the efferent nerves, or in any portion of the conducting medium between the nervous centre and the organs of respiration, as in the spinal marrow above the origin of the phrenic nerve, the brain and medulla oblongata remaining sound, the patient will experience all the distress of a want of breath incident to ordinary apnœa, but will be unable to exhibit it in muscular efforts, because the muscles themselves are paralyzed.

After recovery from apnœa of any considerable duration, and in the progress of partial apnœa, the patient is apt to suffer from inflammation of the lungs, resulting from the congestion of the pulmonary arteries and their ramifications. Similar affections may be experienced in the brain, liver, kidneys, and bowels, arising from the venous engorgement of these organs. The obstruction of the pulmonary circulation endangers also hypertrophy and dilatation of the right ventricle of the heart; and the same cause may give rise to dropsical effusion in all parts of the body. Apnœa, therefore, when incomplete and long-continued, is anything but an uncomplicated disease.

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* My colleague, Prof. S. Jackson, of the University of Pennsylvania, informs me that he has met with cases of this kind, in persons of exhausted nervous force. The patient, in going to sleep, ceases to breathe until awakened by a sense of suffocation, and then breathes with great voluntary effort; and sleep has thus been rendered impossible for a considerable time. He has succeeded in relieving them by a tonic treatment, and inculcating the caution to husband their nervous power, and carefully avoid exhausting it by over-exertion. (*Note to the fifth edition.*)

Appearances after Death.—The livid appearance of the skin, occurring before the extinction of life, continues in the dead body; and the purple spots are found to depend upon vascular congestion, sometimes connected with extravasation of blood. The right cavities of the heart are distended with black blood, as are also the pulmonary arteries, the great venous trunks, and the vessels of the larger viscera, as the brain, liver, spleen, and intestines. Indeed, the whole venous system is more or less congested. At the same time, the left cavities of the heart, the pulmonary veins, and the arteries generally are nearly or quite empty. When death has been sudden, the blood is generally either quite fluid, or but imperfectly coagulated. This tendency of the blood to remain fluid, in suspended animation from apnœa, is highly important in a therapeutical point of view; as its coagulation would render all attempts to restore the vital actions fruitless.

Causes.—The causes of apnœa are very numerous. Independently of those which primarily operate upon the aeration and consequent movement of the blood, there is a great number of diseases, especially of the brain and respiratory organs, in which death is finally accomplished in the capillaries of the lungs, after a series of morbid actions elsewhere. All the well-known causes may be ranked under the heads of 1. those which primarily operate by suspending the movements of respiration; 2. those which prevent the access of air to the vesicles of the lungs, without directly affecting the respiratory muscles; and 3. those, through the agency of which, though air may reach the vesicles, it is admitted in such a state as to be unfit for the arterialization of the blood. To these might be added a fourth set, those, namely, which render the capillaries incapable of performing their office in the transmission of blood, even though air of the proper kind may be freely admitted; but we know too little of these causes to render it worth while to discuss them. It will be perceived that, of the three sets above mentioned, all have the effect of preventing the requisite change in the blood.

1. Of the causes which suspend the respiratory movements, the most frequent is a paralytic condition of the muscles concerned. This may arise from congestion, effusion, inflammation, or disorganization in the brain, involving the medulla oblongata primarily or secondarily; from similar disease, or from mechanical injury of the spinal marrow above the origin of the phrenic nerve, as in dislocation of the neck, by hanging; from the same affections of the spine below the origin of the phrenic nerve, but above that of the intercostals, in which case, though respiration may continue for some time, it is effected imperfectly, and at length ceases; from division or disorganization, in various degrees, of the afferent nerves on both sides; and, finally, from the operation of extreme cold, and of numerous narcotic poisons, which render the nervous centres insensible to the impressions sent up to them from the lungs, and incapable of transmitting the necessary influence to the muscles, through the nerves of motion.

Under this head must also be ranked a continued spasmodic constriction of the muscles of respiration, such as sometimes occurs in tetanus, and is thought also to result from nux vomica in poisonous doses.

Mechanical compression may have the same effect, as when the body, with the exception of the head, is buried by the falling of loose earth about it, or as in the case of the pugilist, recorded by Dr. Roget (*Cyc. of Pract. Med.*, Art. *Asphyxia*), whose chest, in consequence of an attempt to take a plaster-cast of his body in one piece, was so much compressed by the setting of the plaster as completely to prevent the action of the muscles of respiration, and to occasion imminent danger of death, which was the greater as he was prevented from speaking, and could not give warning to those about him. His situation, however, was fortunately perceived in time to save his life, by breaking the case which was forming around him.

2. The causes which act by directly preventing the access of air are very numerous. Under this head may be ranked *smothering* by the closure of the mouth and nostrils, as in the notorious process of burking, or in the accident of being buried in falling earth; *submersion* either of the whole body, as in *drowning*, or of the face alone, as sometimes happens to the infant at birth in the maternal discharges, and to drunkards in a puddle; and *strangulation*, whether by means of a cord around the neck, as in hanging, the application of the bow-string, &c., or by solid bodies in the larynx, pharynx, or œsophagus, mechanically closing the air-passage, or producing the same effect by causing spasm of the glottis.

Similar effects often result from disease. Thus, excrescences in the larynx, closure of the rima glottidis by inflammatory swelling or spasm, palsy of the dilating muscles of the glottis, and tumours pressing upon the air-passages from without, as bronchocele, aneurisms, &c., may all produce suffocation by excluding the air. Accumulations in the bronchial tubes, whether solid or liquid, such as the false membranes of inflammation, blood from hæmoptysis or the bursting of aneurisms, and mucus or pus in chronic bronchitis, the last stages of phthisis, and other pectoral affections in which the secretion exceeds the ability to discharge it, all act in the same way. The obstruction may also exist in the air-cells or extravesicular tissue, as in extensive inflammatory hepatization, tuberculous deposit, apoplectic congestion of the lungs, or pulmonary œdema. Finally, air is equally excluded from the lungs by pressure on their exterior surface, as by serous, purulent, or aeriform collections in the pleural cavities, by the ascent of the abdominal contents through a rupture in the diaphragm, by the free admission of air into the chest through large wounds in both sides, or even by enormous tympanitic distension of the abdomen.

3. The third set of causes are those which affect the air respired. As oxygen is the agent essential to the arterialization of the blood, and as the escape of carbonic acid from that fluid is equally essential to the same result, it follows that whatever excludes oxygen, or causes the retention of carbonic acid, must produce apnœa. The atmospheric air may be so much rarefied as to supply an insufficient quantity of oxygen; and it is possible that suffocation in the vicinity of great fires may arise partly from this cause, in connection with the inhalation of the results of combustion. At very great heights, the air is so rarefied as often very much to affect respiration; but no elevation has yet been attained, at which fatal apnœa would result from this cause alone. *Nitrogen* and *hydrogen gases* appear to have no direct noxious properties, and may be inhaled for a short time with impunity. They allow of the escape of carbonic acid from the blood, but, not containing oxygen, they are insufficient to support life, and an animal soon dies of pure apnœa, which is confined in them. These gases are, however, almost never a real source of danger to life, because they are nowhere collected in large quantities in nature, and, when artificially produced, are so confined as scarcely to admit of being breathed injuriously unless on purpose. The inhalation of *carbonic acid* is a frequent cause of death from apnœa. Difference of opinion has existed as to the action of this gas, some considering it as operating by the mere exclusion of atmospheric oxygen, others ascribing its results to a positively poisonous influence. That the former opinion is not correct is proved by the fact, that air containing the usual proportion of oxygen, but in which the place of the nitrogen has been supplied by carbonic acid, cannot be breathed

with impunity. The latter opinion would seem scarcely more tenable, when we reflect that carbonic acid is constantly present as a natural result in the blood, and in the air of the lungs. The probability appears to be, that it acts by opposing an obstacle, according to a well-known physical law, to the escape of carbonic acid from the blood of the pulmonary arteries, and consequently to the absorption of oxygen. Thus, the blood not only receives no oxygen, but retains its carbonaceous principles, and consequently either ceases to pass through the capillaries, or goes loaded with these principles to the heart and to the brain. Hence, the effects of the inhalation of carbonic acid are more rapid than those of hydrogen or nitrogen, which, though they furnish no oxygen, do not oppose a physical obstacle to the escape of the carbonic acid of the blood, and allow of the absorption of the little oxygen that may have previously existed in the bronchial tubes. It would appear, therefore, that carbonic acid is not itself positively poisonous, like certain other gases, but merely affords by its presence a physical impediment to the changes necessary for the support of respiration. But even the poisonous gases, such as carburetted hydrogen, carbonic oxide, and hydrosulphuric acid, act partly, and, when breathed in a concentrated state, probably in chief, by producing apnœa. The fatal effects from the breathing of the gases arising from the combustion of charcoal and anthracite are not those of carbonic acid alone, but also of the poisonous gases mixed with it, as carbonic oxide, and, in the case of anthracite, sulphurous acid. Hence, besides apnœa, depending on trouble in the cerebral centres, we have from this cause various poisonous effects, among which are local paralytic affections, and vesicular eruptions resembling herpes and pemphigus, which are ascribed by Dr. E. Leudet, of Rouen, to disordered conditions of the peripheral nerves, as well vaso-motor as sensitive and motor. The conclusions of M. Leudet, from his observations, are that these peripheral nervous derangements give rise to the symptoms of neuritis, such as pain, swelling, and even abscess, and in the case of the vaso-motor nerves, to redness of the skin, and vesicular eruptions; that these effects may immediately follow asphyxia, or appear at the end of several days, and may even return after disappearing; that post-mortem examination has demonstrated lesions of the nerves; and, finally, that while the disorders of the vaso-motor nerves are of short duration, those of the sensitive and motor nerves are more durable, and may occasion even incurable paralysis. (*Arch. Gén.*, Mai, 1865, p. 528.) The inhalation of chloroform has of late been a frequent source of fatal apnœa. It probably acts in general by directly depressing the nervous centre of respiration, and thus suspending the function; but there is reason to believe that it has sometimes proved fatal by the mere exclusion of the atmospheric air, to the consequences of which the patient is rendered insensible by its anæsthetic operation. The highly irritant or corrosive gases, such as chlorine, muriatic acid gas, &c., scarcely ever enter the lungs sufficiently to occasion this affection directly. Their fatal effects are owing to inflammation of the respiratory passages.

Of the above causes, many are themselves diseases, and as such are sufficiently treated of elsewhere in this work. But there are a few which merit particular notice here, as prominent agents in the production of apnœa, and interesting in a medical point of view chiefly on that account. Such are drowning, strangulation, and extreme cold.

Drowning.—A person falling into the water usually sinks, chiefly in consequence of the impulse of the fall, but partly, also, perhaps, from an increased specific gravity, resulting from the collapse of fear, and the refrigerating effect of the new medium. In a short time, he generally rises again to the surface, aided by his partly voluntary and partly convulsive movements; but, unless able to swim, he speedily sinks again; and this alternation of sinking and rising is, in some instances, repeated several times before the last struggle is over. As the specific gravity of the body is, in general, slightly above that of water, it usually remains after death beneath the surface, until rendered lighter by the gases generated by decomposition. During the efforts at inspiration, water sometimes enters the bronchia; but the probability is, that, while life continues, this cannot happen to any considerable extent, in consequence of the spasmodic closure of the glottis upon the contact of the liquid. After death, it occasionally finds its way into the lungs in considerable quantities, so as to fill the bronchia to their ultimate ramifications. Water is sometimes swallowed largely, probably during the convulsive but vain respiratory efforts.

Death from submersion has been referred to apoplexy; but it is surely unphilosophical to ascribe a result, so easily accounted for upon other principles, to a cause, which, occurring under different circumstances, is seldom immediately fatal. That cerebral congestion should be observed after death is what might be expected from our knowledge of the pathology of apnœa; and, when hemorrhagic effusion has been discovered, it has probably been the result of previous apoplexy, which may have led to the accident, or of some violent injury of the head, antecedent to or consequent upon the fall. Another conjecture has made death the result of water in the lungs; but experiment has abundantly shown, that the amount of water which usually enters the bronchial tubes of drowning persons is altogether insufficient to destroy life. It is quite unnecessary to search for any other cause of death, in ordinary cases, than the mere exclusion of atmospheric air. It has been plausibly supposed that, in some instances, syncope or fainting may take place, either from alarm, or the physical shock of the accident upon the nervous system; and attempts have been made, upon this principle, to account for certain peculiarities in the appearances after death, and in the results of treatment.

There is often about the mouth and nostrils of the drowned more or less frothy mucus, which is sometimes stained with blood. The same appearances are observed, upon dissection, on the surface of the air-passages; and some water in a frothy state is not unfrequently found in the bronchia. In most instances, the right cavities of the heart, the large veins, and the great viscera, including the brain, are gorged with venous blood; while the left ventricle contains comparatively little. Sometimes, however, the brain and all parts of the body are found in a normal state, without any marks of congestion; as if the cord of life had been suddenly snapped, before the healthy course of the blood had been perverted. These are the cases in which syncope is supposed to have occurred immediately before, or at the moment of submersion.

It is an important question, how long the body may remain under water before life becomes wholly extinct, and resuscitation impossible. If recovered within five minutes, there is every reason to hope that, though external signs of life may have disappeared, the patient may be saved; and there is no reason to despair of a favourable issue, though ten, fifteen, or even twenty minutes may have elapsed from the time of submersion. Resuscitation very seldom takes place after half an hour. The longest period, in the records of the Humane Society of London, is three-quarters of an hour; and, out of twenty-three cases of recovery reported by the similar establishment at Paris, the patient had in one been under water three-quarters of an hour, in four half an hour, and in three fifteen minutes. It is true that accounts are on record of recoveries after hours of submersion; but no one at present attaches any faith to them. In those well-authenticated cases of recovery in which the period of apparent death has been protracted much beyond the usual time, it has been supposed that the patient may have been affected with syncope at the moment of submersion; as, in this condition, the system does not require the support of the respiratory process, and the vital susceptibilities may linger for a longer time than when impaired by the noxious effects of the misplaced venous blood. Dr. Brown-Séquard states that a reduction of temperature has a powerful influence in retarding death from asphyxia. If two animals are drowned by immersion in water, one with his temperature much diminished immediately previously to immersion, and the other in the normal state, the former will live twice, thrice, even four times as long as the latter; and life under water may in this way be prolonged twelve or fifteen minutes. We can thus account in some instances for prolonged life in drowning, without necessarily having recourse to absolute syncope. If the water happen to be much colder than the body, a shock is made which reduces the action of the heart considerably, and puts the system into a state in which it may for a considerable time resist the causes acting through the lungs. (*Dub. Quart. Journ.*, May, 1865, p. 434.)

It is occasionally important, in a medico-legal point of view, to determine whether a body drawn from water had lost life previously to immersion or by drowning. In the cases of syncope at the time of immersion, it might not always be possible to decide this question; but when the appearances above detailed are presented there can be little room for doubt; and Dr. Faure gives as certain evidence that death was produced by drowning, the presence of frothy water tinged with blood in the bronchia, with ruptures in the pulmonary tissue, and effused blood in their neighbourhood, proving the powerful efforts of the individual to expand his lungs. (*Arch. Gén.*, Avril, 1860, p. 476.)

Strangulation.—Allusion is here had to strangulation by means of a cord about the neck. This may be effected either without suspension or with it, and the results are somewhat modified accordingly. In both cases, death generally depends upon the exclusion of air, consequent upon a closure of the trachea. It has been ascribed to apoplexy, produced by pressure upon the jugular veins, and the prevention of a return of the blood from the head. There is, no doubt, great congestion of the cerebral veins and sinuses, and, in some instances, probably, apoplectic effusion. But death from this cause is much slower than is usually the case in strangulation; and, if it ever happens, it must be in cases in which the entrance into the lungs is not entirely closed. This occasionally occurs in consequence of ossification of the larynx, or an inaccurate adjustment of the cord, and the fatal event may be in this way considerably protracted, if not averted altogether. An instance is on record in which a female, after hanging all night, was found still living in the morning, owing to the ossification of the larynx; and another, in which a man, in whom the trachea had been opened, and a tube inserted previously to hanging, though he became insensible, was restored to a brief animation, after having been taken down from the gallows. The inference is, that though, when the closure of the air-passages is incomplete, death may result from apoplectic congestion or effusion; yet, in ordinary cases, it scarcely even contributes to the result. When strangulation is effected by hanging, in the ordinary mode in which criminals are executed, the weight of the body in falling sometimes occasions dislocation of the vertebræ, and death may then ensue immediately from injury of the spinal marrow, above the origins of the phrenic nerve. This also happens in other forms of strangulation adopted as a mode of execution, in which a sudden twisting of the neck is effected with the closure of the trachea.

The time, therefore, which elapses before death in hanging varies according to circumstances; and the phenomena of course also vary. When the neck is broken, death is almost immediate, and probably without the least suffering. When the closure of the trachea is complete, without dislocation of the cervical vertebræ, there is a brief feeling of suffocation, and a struggle for breath; but very soon the brain becomes insensible to pain, and the convulsive movements which take place are involuntary, and wholly without consciousness. When the closure is incomplete, as when the cord passes above the larynx, and over the angles of the jaw, consciousness and suffering continue for a shorter or longer period; but, even in this case, insensibility and death ultimately ensue, either from pressure on the brain, from the imperfect admission of air, or from the two causes conjoined. It is a singular fact, that, in strangulation by suspension, there is very often a turgescence of the genital organs, with erection of the penis, and even seminal discharge. This has been variously explained, but not quite satisfactorily. Perhaps it may be connected with disorder of the spinal cord. The face is swollen and livid, the eyes open and prominent, the conjunctiva injected, and the tongue often projected from the mouth, from which bloody mucus occasionally issues. The appearances after death will be found in works on medical jurisprudence. It may be mentioned that a mark produced by the cord around the neck is always visible.*

Extreme Cold.—The first effect of severe cold, applied generally to the body, is extremely painful, owing to the impression made upon the extremities of the nerves. Should the cause, however, continue to operate after the tendency in the system to react has been overcome, the patient is sensible of a benumbing effect, and gradually evinces in his feelings and movements the signs of cerebral depression. If walking, his steps become uncertain and tottering, his utterance indistinct, and a drowsiness which he is unable to resist steals upon him, and gradually increases into deep sleep and entire insensibility, from which it is impossible to arouse him. Death now speedily follows. Different views have been taken of the pathology of the case. The fatal result has been ascribed to paralysis of the respiratory muscles from the direct influence of cold; but this view does not account for the cerebral phenomena. Some have supposed that the heart first feels the fatal influence, and that the patient dies of syncope. But this does not correspond with the appearances after death, which are those usually found in apnœa. The probability is, that the benumbing influence, which is first experienced in the extreme nerves, gradually extends to the nervous centres, which are thus incapacitated for the performance of their functions, and respiration consequently ceases. After death the right cavities of the heart, the large venous trunks, and the great viscera, including the brain, are gorged with black blood; but no apoplectic effusion is observed.† Resuscitation has been effected in these cases after all the phenomena of life had ceased.

Treatment.—The first object, in the treatment of apnœa, is to remove the cause, and, if this be obscure, the most careful examination should be directed to its discovery. This rule is equally applicable, whether the cause be extraneous to the system, or consist in some diseased state of the respiratory organs, or other part of the body. Life not unfrequently depends upon prompt obedience to this precept; and hence the importance of studying carefully all the possible causes of the affection, so as to be prepared for any emergency. When the appearances of life have not ceased, the removal of the cause will often be the only remedial measure required. In suspended animation, the following measures may be employed, as a general rule.

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* A case is recorded in the *Dublin Quarterly Journal of Medical Science* (Aug. 1854, p. 86), in which this mark was so slight that, unless sought for, it might readily have escaped notice; and no disturbance of the subcutaneous tissue could be discovered upon dissection of the part. (*Note to the fourth edition.*)

† Some observations recently made, in Scotland, on the bodies of persons who had perished from intense cold, have given results somewhat different from those previously admitted. Along with a general deficiency of blood in the peripheral portion of the circulation, there was congestion of the large vessels near the heart, and of the heart itself, *on both sides of the circulation*, the blood being generally more or less coagulated, and in some instances dark-red, but in others brighter than in health. (*B. and F. Med.-chir. Rev.*, Oct. 1855, p. 375.)—*Note to the fifth edition.*

In two cases occurring subsequently to those referred to in the preceding note, the same peculiarities were noticed; namely, an arterial hue of the blood, and its collection in unusual quantities in both sides of the heart. There were, besides, in these cases, diffused patches of redness in various parts of the skin not dependent. (*Ibid.*, Oct. 1860, p. 364.)—*Note to the sixth edition.*

The body should be stripped of clothing, wrapped in a warm blanket, and placed in bed in a well-aired apartment, with the head and shoulders somewhat elevated. As the suspension of respiration is the important pathological condition, efforts should be immediately made to restore this function, and it is of the utmost consequence that no time should be lost. The object may sometimes be accomplished by throwing cold water upon the face, or dashing it upon the shoulders, in cases in which the temperature of the surface has not already been reduced by the cause of the apnœa, as in freezing or drowning. The sudden impression of cold upon the surface is a powerful stimulus to the respiratory process. Any one may become sensible of this, by observing that the effect of cold water, sprinkled upon his own face, is to induce immediately an involuntary gasping inspiration. When the nervous centre yet retains susceptibility, this slight remedy is sometimes sufficient to rouse it into action, and to cause a transmission of the requisite motor influence to the muscles of respiration. The remedy is especially applicable, when the insensibility has been produced by a sedative poison, such as hydrocyanic acid, or one of the irrespirable gases, as carbonic acid gas, or the vapours of chloroform. For a similar purpose, powerful irritants may be applied carefully to the nostrils. One of the most efficient of these is the solution or spirit of ammonia, which may be held near the nostrils, or applied, properly diluted, by means of a feather or camel's-hair pencil, to the Schneiderian membrane.* Caution, however, is necessary to avoid such a use of it as to provoke inflammation of the nasal or respiratory passages, upon the occurrence of reaction. Serious consequences may readily ensue from imprudence in this respect. Perhaps the burning of a sulphur-match under the nostrils, which has also been recommended, may be somewhat preferable on this account; as sulphurous acid gas is less corrosive than ammonia. It has been proposed to rouse the respiratory organs into activity by operating on the sensibility of the glottis, and for this purpose to introduce one or more fingers deep into the throat, so as to come into contact with the top of the larynx. This was done with success by Dr. Escallier in two cases of apnœa from chloroform. (*L'Union Méd.*, A.D. 1849, No. 148.)

But the all-important measure is artificial respiration. In relation to this measure, I shall first present a view of the plans generally pursued or recommended, until recently, and afterwards call attention to two methods; one proposed by the late Dr. Marshall Hall, and the other subsequently by Dr. Henry R. Silvester, which, from the accounts published in the journals, appear to have been employed with extraordinary success. Artificial respiration should be resorted to in all cases of complete apnœa, and should never be delayed longer than may be necessary for the requisite preparation. The measures above mentioned may be employed in the interval. The most convenient instrument for the purpose is a pair of bellows. The nozzle may be inserted either directly into one nostril, or into the larger end of a smooth tube, the smaller end of which has been introduced into the nasal passage. A pair of bellows, furnished, like those of the Humane Societies, with a flexible tube and a smooth nosepiece, should be preferred if at hand. The instrument being properly adjusted, an assistant should carefully close the unoccupied nostril and the mouth with one hand, while with the other he gently presses the pomum adami of the larynx backward so as to close the œsophagus. The operator is then to blow into the lungs at intervals, allowing free exit to the air after each inflation, by removing pressure from the nose and mouth, and aiding the elasticity of the walls of the chest by moderate pressure with his extended hand upon the epigastrium. Natural breathing should be imitated as nearly as possible, both in relation to the quantity of air injected, and the frequency of the operation. At one time, it was thought best to expand the chest to its utmost dimensions, so as to cause the air to penetrate fully into the air-cells, and to displace the useless or injurious gases that might be contained in the chest. But such a procedure is hazardous, by endangering the rupture of the air-cells, and thus irreparably injuring the delicate pulmonary texture. Only so much, therefore, should be introduced as may cause a degree of dilatation of the chest as nearly as possible equal to that of healthy respiration; and the operation should be repeated about fifteen times a minute. The force employed should be as slight as is compatible with the end in view.

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* It has been suggested that ammonia, in cases of apnœa, may act partly by neutralizing the carbonic acid in the lungs, reaching the remote parts of the air-passages through the property of diffusion possessed by all gases; and, when it is considered how rapidly even a small quantity eliminated at one point will impregnate the air of a whole apartment, the idea does not appear improbable. (*Note to the fifth edition.*)

Should no proper instrument be at hand, the operator should use his own lungs, applying his mouth to that of the patient, or, what is better, to one of the nostrils by means of a suitable pipe, taking great care not to injure the delicate mucous membrane by the hardness or roughness of the tube employed. Whatever avenue for the admission of air may be selected, the others should be closed, and gentle pressure should be made on the larynx in the manner already described. An objection has been urged to this mode of artificial respiration on the ground that the air proceeding from the lungs of a living person has become unfit for use; but experience has shown that it is still sufficiently oxygenized to reanimate suspended respiration; and, in fact, chemical analysis has proved that each portion of air expired has undergone but little change. To obviate the objection, however, as far as practicable, the operator may take a deep breath two or three times before commencing the process of inflation, so as to have the air in the purest possible state. Advantages of the method are that the air introduced is of the proper temperature, and that there is less danger of injury to the lungs of the patient, as the operator's own powers of insufflation will afford the best measure of the capacity of resistance in the organs acted on. Another advantage is, that it can be applied immediately, as soon as the body is placed in a proper position, and the air-passages, when requisite, properly cleansed. It is peculiarly adapted to cases of infants, and has been employed, within the knowledge of the author, with the effect of restoring suspended life in a child, apparently dead from the effects of laudanum.

In order to obviate the difficulty which is sometimes experienced of forcing the air beyond the glottis, it may be advisable to attempt the introduction of a catheter or other tube into the larynx, and through it to force air into the lungs by a pair of bellows or the mouth. Orfila recommends a tube eight or nine inches long, larger anteriorly than posteriorly, somewhat flattened towards its smaller end, so as to adapt it to the shape of the larynx, properly curved, and surrounded near the flexure with a piece of soft leather which may serve to close the upper opening of the glottis. As a last resort, should other means fail of introducing air into the lungs, tracheotomy may be performed, and artificial respiration sustained through a tube introduced into the opening. This, however, can be very seldom necessary, unless in the case of some positive obstruction existing in the larynx.

A plan of effecting artificial respiration by galvanism was proposed by M. Leroy d'Etoiles, which consisted in introducing a fine needle into each side between the eighth and ninth ribs, a few lines deep, so as to touch the attachments of the diaphragm, and then connecting the needles with the opposite poles of a small galvanic battery. As soon as the diaphragm feels the influence of the passing current, it contracts. The galvanic circuit is now to be interrupted so as to allow of relaxation; and afterwards to be renewed and interrupted alternately, so as to keep up a succession of contractions and relaxations, as in healthy breathing. The author of this process found it successful in animals apparently dead from submersion.

The plan of Dr. Hall, above referred to, known as "*the ready method*," is to restore respiration by means of alternate contraction and expansion of the chest, effected by a combination of position with artificial pressure. It was long since recommended, when proper instruments for artificial respiration were not at hand, to imitate their effects by first making pressure around the thorax and upon the abdomen, so as to lessen the dimensions of the thoracic cavity, and thus expel a portion of the air, and then allowing expansion to take place through the elasticity of the chest, by which a fresh portion of air might be introduced. But this plan was not found to be efficient. One of the difficulties in effecting artificial respiration has been, according to Dr. Hall, the supine position of the patient, by which the tongue fell back upon the glottis, and closed it against the entrance of air. This difficulty his method obviates. The following are the rules which he laid down, and which are asserted to have been very successful in practice. No time should be lost in putting them into operation. Immediately after the ineffectual trial of the ordinary methods of exciting respiration, such as irritating the nostrils and fauces, dashing cold water, or, as Dr. Hall advised, cold and hot water alternately, on the face and shoulders, the patient should be placed in a prone position, or upon his face, with his arms under his head. By this position the tongue falls forward, and the glottis opens for the admission of air. By the weight of the body, moreover, pressure is made upon the chest and abdomen, so as to produce a contraction of the thoracic cavity, and consequently the expulsion of a portion of air from the lungs. This effect of posture should be aided by making pressure with the hands along the back and sides of the thorax. The body is then to be gradually turned completely upon the side, "and a little more," so that the chest through its elasticity may expand again, and the fresh air be made to enter. One act of respiration is thus effected. The same measure should be deliberately repeated, once every four seconds, so as to imitate natural breathing, and perseveringly continued until successful, or clearly hopeless.

The plan proposed by Dr. Silvester, as it consists in effecting inspiration through the same agents as those by which the act is performed in life, is denominated by him the "*physiological method.*" The exterior muscles, by the contraction of which the lungs are expanded in full inspiration, are by this method made to accomplish the same object through a force applied from without; that is, by raising the arms above the head, so as to put upon the stretch the various muscles connecting them with the walls of the chest, as well as the intercostals. The ribs are thus both elevated and rotated outward, and of course the cavity of the chest considerably expanded. In carrying the process into effect, the body is placed on the back, either on a level surface, or preferably on a plane inclining somewhat upward from the feet, with a firm cushion or similar object under the shoulders, and the head supported in a line with the chest. The tongue is then drawn forward a little without the mouth on one side, so as to prevent it from falling back upon the glottis; and the operator, grasping the arms a little above the elbows, draws them upward so as nearly to meet above the top of the head. The expansion of the chest having been thus effected, the arms are promptly returned to their place beside the body, and expiration assisted by moderate pressure with both hands over the lower part of the sternum. This operation should be repeated about twelve or fourteen times in a minute, so as to imitate natural breathing. Should no spontaneous respiratory movement take place, it is recommended to dash water, either cold or at a heat of 120° F., on the face and chest, while the body is kept warm by friction, hot blankets, or the warm bath. It is also recommended, in cases of drowning, before putting this plan into operation, to place the body, with the face downward, upon a board or table, sloping at an angle of about 30°; the head being at the lowest end, and projecting a little beyond it. The mouth is then to be opened, and the tongue drawn forward, so as to permit the escape of liquid from the lungs or stomach, which may be favoured by gentle pressure on the back. This operation should not occupy more than a few seconds, and should be discontinued as soon as liquid ceases to pass the lips. A committee of eminent practitioners and physiologists, appointed by the Royal Medical and Chirurgical Society of London to investigate the subject of suspended animation, after a full examination and numerous experiments, reported in favour of the method of Dr. Silvester, as, on the whole, the most expedient for performing artificial respiration, at least in reference to uncomplicated apnœa produced by the simplest means, and that caused by drowning. (*Medico-chirurg. Transact.*, A.D. 1862, xlv. 492.) The advantages claimed for this method over that of Dr. Hall are, 1. that it imitates nature by making inspiration and not expiration the first act to be performed; 2. that the quantity of air introduced into the lungs is much greater, and more under the control of the operator; 3. that both sides of the chest are equably inflated; 4. that there is less liability to injury of the body by rough usage; 5. that there is no danger of the passage of the contents of the stomach into the trachea, as in the prone position of the other plan; 6. that the tongue is less likely to interfere with respiration; and 7. that the method does not prevent the simultaneous use of the warm bath, which is deemed an important auxiliary measure. (*Med. T. and Gaz.*, Oct. 1863, p. 419.) There does not, however, seem to be a universal accord in this preference; and, in the "*Instructions for the Restoration of the Apparently Dead from Drowning*," put forth by the "*Royal National Life-boat Institution*" of England, and adopted by the "*Lords Commissioners of the Admiralty*," the directions are first to put the "ready method" in operation, and, if this should fail after a trial of from two to five minutes, then to have recourse to that of Dr. Silvester. (*Lancet*, June, 1864, p. 643–4.)

By whatever plan artificial respiration is carried into effect, it should not be hastily abandoned if unsuccessful; though perseverance for six hours, as recommended by Dr. Curry, can scarcely ever be requisite. An important caution is not to leave the patient too soon after resuscitation. This is especially necessary when the cause still continues to operate, as in insensibility from narcotic poisons. An instance is on record, in which, after apparent death from opium, and complete resuscitation by artificial respiration, the patient, an adult female, was nearly lost in consequence of being prematurely left. A relapse took place, from which, however, a reapplication of the same measure, and a perseverance in its use, fortunately rescued her. (*Am. Journ. of Med. Sci.*, xx. 450.) In relation to the efficacy of artificial respiration, success may be expected from it, if the heart continue to contract in the least degree, though respiration and arterial pulsation may have ceased; nor is there reason to despair even when the heart no longer moves; for, as before stated, this organ often retains its contractility for a short time afterwards, and may respond to the stimulus of arterialized blood.

In apnœa from sedative poisons, as chloroform, for example, the introduction of nitrous oxide or the exhilarating gas into the lungs might prove useful; and I would suggest to the surgeon who may deem it advisable to have recourse to the anæsthetic properties of chloroform in his operations, the propriety of being provided with a bagful of this gas, which might be forced into the lung, should respiration cease.

But, while attempts are thus made to restore the action of the lungs, the nervous centres should be stimulated by impressions made upon the skin and other accessible parts. The surface should be kept duly warm, and for this purpose, when not inconsistent with the method of artificial respiration employed, bottles or other vessels filled with warm water, heated bricks wrapped in flannel, or woollen cloth sufficiently heated, should be applied about the body; but caution must be observed, that the substances used shall not be so hot as to burn the skin; and a good rule is not to permit their temperature to exceed 100° F. Gentle friction over the whole surface may also be employed, either with the hand, a piece of flannel, or a soft brush; but here again care is requisite not to injure the skin. Dr. Hall particularly recommended that the friction should be applied to the extremities, and directed upward, as this is the course of the returning blood. Should the least sign of sensibility be evinced, rubefacients may also be resorted to, such as oil of turpentine, Cayenne pepper heated with brandy, and liniment of ammonia, with the same regard to the present want of susceptibility, and to future possible reaction, as in the case of the other remedies. Though the skin may not exhibit, during the collapse, the least evidence of the action of heat, friction, and rubefacients, yet an impression is made by them, which, when sensibility and vital action are restored, may evince itself, if due caution be not observed, in violent inflammation, ulceration, and even sloughing.

As the lower bowels often retain a degree of impressibility until the very last, it will generally be advisable to employ stimulating enemata, among which oil of turpentine, carbonate of ammonia in solution, the ethereal preparations, and brandy are perhaps the most suitable. They are especially indicated when the cause of the affection is of a directly depressing nature, as in the case of certain narcotic poisons. It has even been proposed to introduce these stimulants into the stomach by means of a tube and syringe; and cases no doubt occur in which the measure might prove salutary.

The powerful agency of electro-magnetism may also be resorted to. A current made to pass from the pit of the stomach to the back part of the head will sometimes rouse sensation, when life is almost extinct.

It has been a practice with some to abstract blood in cases of apnœa. This measure can be proper only in those instances in which, from the peculiar nature of the cause, there is unusual congestion in the brain; and even in these should be employed with great caution. The blood should be taken preferably from the jugular vein; as both the brain and the right side of the heart, which is also usually overloaded, are thus directly relieved. It has been sufficiently proved by experiment that, though there are valves at the mouth of the external jugular, yet, when the vein is much distended, the resistance of these valves to the reflux of the blood is overcome, and the depletion may, therefore, be effected immediately from the descending cava and the heart. (See *Ed. Med. Journ.*, Nov. 1856, p. 425.)

The danger is by no means always passed, in apnœa, when the vital actions have been restored. The brain not unfrequently evinces signs of disorder, arising from the previous congestion; and imperfect inflammation, and various functional derangement in the thoracic and abdominal viscera, are not uncommon from the same cause. The errors, too, of an irregular general reaction, sometimes excessive, and sometimes deficient, require careful watching. But, in the treatment of these affections, the physician must be guided by his general knowledge of disease; as the effects are too diversified and uncertain to admit of special therapeutic rules. The original cause has much influence in the production or modification of these secondary symptoms, and not unfrequently it continues to operate, in a greater or less degree, after the patient has been rescued from its more violent effects.

A few remarks in relation to special measures, required in apnœa from certain peculiar causes, will be necessary to complete a view of the treatment.

Drowning.—It has been a popular practice to suspend the body by the feet, immediately after removal from the water, in order to allow the liquid which may have been swallowed to run out by the mouth. It is scarcely necessary to state that this is an irrational practice, and can be productive only of injury, as it adds the influence of gravitation to the causes which have already overloaded the veins and sinuses of the brain.

The body should be immediately stripped of the wet clothing, then wiped perfectly dry, and wrapped in a blanket as already recommended. It is especially important, in cases of drowning, to keep the surface duly warm; as much of the vital heat has been withdrawn from the body by the conducting power of the medium by which it has been surrounded. It is true, as stated by Dr. Hall, that the coldness of the water has had a tendency to retain the excitability longer than if the body had been immersed in hot water, and therefore to render the chances of restoration greater; but this is no proof that, when restorative measures are used, all possible efforts should not be made to call this excitability into action. The *warm* bath would not be a suitable agent for this purpose, because the influence of warm water is sedative, and would rather favour than obviate apnœa. But a moderate degree of dry heat appears to me to be clearly indicated. Dr. Hall advises that, in these cases, the body should be immediately turned upon the face, in order to let liquids run out of the mouth, which should also be carefully cleansed by means of the finger, or the feathered part of a quill. Recourse should then be had to artificial respiration, and the other measures above indicated; and the efforts at restoration should not be relaxed for several hours. A remedy, formerly much relied on in the treatment of the drowned, was the injection of tobacco smoke into the rectum. This would seem, with our present notions of the action of tobacco, to be contraindicated; and, accordingly, most recent authors discard it altogether. But it should be recollected that the empyreumatic products of tobacco do not operate precisely in the same manner as the narcotic itself; and it is affirmed by Fodéré (*Dict. des Scienc. Méd.*, Art. *Noyés*), that the proportion of the drowned who have been rescued since the abandonment of this measure has been less than while it was in use.

It has been already stated that considerable quantities of water sometimes penetrate into the bronchial tubes, even down to their remotest ramifications. Now it is obvious that, in such cases, the beneficial operation of artificial respiration must be much impeded, if not altogether prevented; and it is highly important to rid the lungs of their burden. This may be done in some degree by suction. When, therefore, the chest yields a dull sound upon percussion, and respiration does not appear to be satisfactorily performed, attempts may be made, by means of a catheter introduced into the larynx, and an air-tight syringe or the mouth applied to its outer extremity, to withdraw the liquid from the air-passages. It has even been proposed to effect the same object, by the same instruments, through an artificial opening in the trachea; and this might be justifiable as a last resort.

Strangulation.—The only special measure requiring attention in this case is the abstraction of blood. In consequence of the severe cerebral congestion which results, in most instances, from the mode in which the cause acts, it is more necessary in these than in ordinary cases of apnœa to unload the veins of the brain; and a moderate bleeding from the jugular would therefore appear to be called for.

Freezing.—Here the first object is to restore warmth, but yet to restore it very gradually. It has been found that, in cases of insensibility from cold, the sudden exposure of the body to an elevated temperature is certainly fatal. If reaction takes place, it is short and violent, and the patient soon dies, not unfrequently with delirium. In order to avoid this danger. the surface should be first rubbed with snow if at hand, which, though cold, is when near the melting point warmer than the frozen body; or the patient should be immersed in a bath of very cold water; and afterwards the applications made should be gradually less and less cold, until the temperature is at length raised to the natural standard. As soon as the muscles and other soft parts are sufficiently relaxed to admit of easy motion, artificial respiration, and the other means already enumerated as appropriate to apnœa in general, should be tried.*

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* Dr. B. W. Richardson, of London, after numerous experiments, in almost every direction, on the subject of suspended animation, performed sometimes on the human body, but generally on the lower animals, has come to the following conclusions, consigned to an essay in the *British and Foreign Medico-chirurgical Review* (April, 1863, p. 478).

The cardiac sounds may be heard by auscultation, in suffocated animals, from 8 to 9 seconds after the last respiratory effort. The second sound first ceases; the first a few seconds later, after which there is a slight convulsive start, and all is quiet. The heart, however, still retains its irritability, and, on exposure to the air, or if irritated, will resume its action; but its contractions are not efficient, and do not propel the blood.

Muscular irritability remains longest after death from chloroform, averaging a period of 71 minutes. After sudden strangulation, it continues 46 minutes; after rapid suffocation with carbonic acid, 29 minutes; after slow suffocation from the same cause, 15 to 20 minutes; after drowning, 5 to 15 minutes.

The blood remains fluid after apparent death for at least 20 minutes, often for hours, without organic change, and capable of performing all its functions, if again put in motion. In one human subject, examined by Dr. Richardson, it had retained its fluidity at the end of 12 hours. A fatal obstacle to restoration is coagulation of the blood. After this has occurred, all efforts are hopeless. If any doubt exist on the subject, a vein may be opened, when the fact will be evident by the appearance of a coagulum.

The great difficulty in the way of restoration is the interruption in the continuity of blood. "A break in the blood-column," which takes place in the capillaries of the lungs, is fatal. Artificial respiration can here be of no avail, as there is no blood to be acted on by the air. According to Dr. Richardson's experience, when the sounds of the heart are utterly lost, there is very little to be expected from any efforts at restoration.

Efforts, however, should be made to restore respiration, and the method preferred by Dr. Richardson is that of the double-acting bellows; by which the amount of air thrown in may be regulated. From 10 to 15 cubic inches are sufficient. Excess in this respect is useless, and may do irreparable mischief. The whole operation should be moderately conducted. After this he prefers Dr. Silvester's method. Disturbance of the body should be avoided as much as possible, as it may interfere with the spontaneous efforts of nature.

Galvanism in all forms is useless and worse than useless. He has succeeded in restoring respiration by this means; and, by bringing it to bear on the heart, has excited that organ into contraction; but never with any useful result. It annihilates, by over-stimulation, the excitability of the muscles, and thus destroys the chances of spontaneous reaction, and prevents the favourable effects of other means.

He had tried, by diversified measures, to bring the circulation into movement, which is the great thing wanted, but without success. He seems, however, to attach more importance to warmth for this purpose than any other agency; and relates instances in which animals, deprived of all signs of life by drowning, had been restored by accidental exposure to warmth, as, for example, in the midst of a dung-heap. Among other means of restoring circulation, Dr. Richardson had also endeavoured in various ways to oxidise the blood, but without satisfactory results.

A resumé of the practical conclusions reached by Dr. Richardson may be given in a few words. 1. Artificial respiration is not only useless but injurious, if the heart no longer transmits the blood, however feebly. 2. If a current of blood can be made to traverse the arterial channels, respiration will commence. 3. Gentle warmth favours this movement of the blood. 4. Galvanism is dangerous. 5. In the interval between apparent death and coagulation of the blood, restoration of life is not absolutely impossible; and to effect it the great point is to restore the circulation of the blood.

The reader need not be informed that my own views, as presented in the text, are less discouraging. Believing that death in apnœa generally results from the suspension of circulation in the capillaries of the lungs, in consequence of the want of due change in the blood, and that the heart is only secondarily involved, I believe that the most promising measures are such as will restore its normal condition in the capillaries, and thus enable them to resume action. I do not think there is cause for doubt, from the great number on record of cases of revival under apparently the most unpromising circumstances, that the blood-current has been restored after complete cessation of the heart's action. (*Note to the sixth edition.*)

SECTION IV.

DISEASES OF THE CIRCULATORY SYSTEM.

SUBSECTION I.

DISEASES OF THE HEART.

ase of the heart was imperfectly understood until within a comparament period. In its organic forms, it was thought to be very rare, and uniformly fatal. It was not generally recognised until in its advanced hen beyond the reach of remedies; and often it escaped recognition fe, being concealed by certain prominent morbid affections of which it ause, such as pulmonary congestion and hemorrhage, apoplexy, and forms of dropsy. Cases formerly considered and treated as simple rax were very generally diseases of the heart.

affections are now known to be very frequent. They are supposed, the aggregate, to be inferior only to phthisis in fatality. Though to no age, they are much more frequent late than early in life. They n said to be in the old what pulmonary consumption is in the young. more than five hundred dissections witnessed by Dr. Clendinning, about presented signs of diseased heart; and the proportion of males was at of females.

gh very dangerous, they are not so uniformly fatal as was at one time d. Treated in their early and forming stages, they are often effectued; and, what is no less important, they may, in numerous instances, nted by a judicious treatment of certain conditions of the system, neglected, are very apt to induce them, but which are entirely under rol of remedies.

ur improved knowledge of cardiac diseases, we are indebted mainly to rt, Laennec, Louis, Collin, and Bouillaud in France; Hope, Williams, and Stokes in Great Britain; and Dr. Pennock in this country; facts of importance have been contributed by many others.

eliminary to the consideration of the particular diseases, it will be of ge to treat of the means of exploring them which modern investigations ced in our hands, and which render their diagnosis at present almost with proper study and practice, as it was formerly difficult and un- I shall take it for granted that the reader has a general knowledge ucture, position, and actions of the heart; but introduce a figure, with atomical references, in order that the student, by consulting it in conwith the remarks which follow, may be able more clearly to understand The signs of the heart's action and condition will be considered under ral heads of 1. those recognized by the touch, 2 those obvious to vision, afforded by percussion, 4. those yielded by auscultation, and 5. genetoms. It will be most convenient, under each of these heads, so far priate, to treat first of the signs as they are presented in health, and es of their modifications, and of the new signs exhibited in disease.

gure here introduced, with the following references, has been copied, by perthe author, with some slight changes, from a communication made by Dr. C. k to the Pathological Society of Philadelphia, and published in the *Medical Ex*r April, 1840 (vol. iii. p. 218).

heart is represented with the pericardium removed, the lungs drawn backwards leaving its entire anterior surface exposed—the cartilages and ribs in front of ted by dotted lines.

1. *Signs by Touch.—Pulsation or Impulse.*

The beating of the heart may almost always be felt in health, in one position or another of the body, by placing the hand upon the chest, as nearly as

S, Outline of the sternum.
C, Clavicle.
1, 2, 3, 4, 5, 6, &c., The ribs.
1′, 2′, 3′, 4′, 5′, 6′, &c., The cartilages of the ribs.
4′′, Right and left nipples.
a, Right ventricle.
b, Left ventricle.
c, Septum between the ventricles.
d, Right auricle.
e, Left auricle.
f, The aorta.
f′, Needle introduced through the middle of the sternum, perpendicular to its plane, opposite the cartilage of the third rib, passing into the aortic valves.
g, The pulmonary artery.
g′, Needle introduced between the second and third cartilages, half an inch to the left of the sternum (perpendicular to the plane of the thorax), passing into the valves of the pulmonary artery.
h, Vena cava descendens.
i, Line of direction of the mitral valve. The dotted portion is that part of it posterior to the right ventricle.
i′, Needle introduced perpendicular to the plane of the thorax, three inches from the left margin of the sternum, at the lower edge of the third rib, and passing into the mitral valve at its extreme left.
k, Line of the tricuspid valve.
m, *n*, Needles introduced perpendicular to the thorax, at points where the dulness of percussion of the heart ceases, which, being projected, pass to the borders of the organ.
o, Trachea. *p*, Apex of the heart.

"Upon reference to the drawing, it will be seen that the *valves of the aorta* lie beneath the middle of the sternum, opposite the lower edge of the cartilages of the third ribs; that the *valves of the pulmonary artery* are more superficial, and are placed to the left, and about half an inch above. The *aorta*, from its origin, curves upwards towards the right, extending between the cartilages of the second and third ribs slightly beyond the right margin of the sternum; at the lower margin of the second cartilage, the arch of the aorta commences and inclines to the left, crossing the pulmonary artery where it lies beneath the left second rib, and, ascending as high as the first rib, turns downwards. The *pulmonary artery*, from its origin in contact with the sternum, commences at its left margin, where it is joined by the cartilage of the third rib, bulges at the interspace between the second and third cartilages close to the sternum, and dips beneath the aorta opposite the junction of the second cartilage and sternum.

"The right divisions of the heart, being most superficial, form the greater part of the anterior surface; the *right auricle* reaches from the cartilage of the third rib, to that of the sixth, and between the third and fourth, where its breadth is the greatest, it extends laterally near *one inch and one-third* (*when full of blood*[*]) to the right of the sternum. About one-third of the right ventricle lies beneath the sternum, the remaining two-thirds being to the left of that bone; the *septum* between the ventricles coincides with the osseous extremities of the third, fourth, and fifth ribs, and, on the fourth rib, is midway between the left margin of the sternum and nipple. A small part, say one-fourth of the left ventricle, presents anteriorly; and, when the lungs are separated, a portion of the left auricle is visible between the second and third left ribs, two inches from the left margin of the sternum. With the exception of these portions, the whole of the left ventricle and auricle lie posteriorly to the right ventricle; and the entire left divisions, with the exception of a small portion of the base connected with the semi-lunar valves of the aorta, lie on the left of the sternum.

"The heart being movable, the tricuspid and mitral valves necessarily change their relative position to the parietes of the thorax, with every change of posture of the body. When examined in the dead body, the normal situation of these valves is as follows: the *tricuspid valve* extends obliquely downwards from a point in the middle of the sternum, immediately below the third rib, to the right edge of the sternum, at the lower margin of the cartilage of the fifth rib; the *mitral valve* commences beneath the lower margin of the left third rib, near the junction of its cartilage with its osseous extremity (two and a half to three inches to the left of the sternum), and runs slightly downwards, terminating opposite the left margin of the sternum, where it is joined by the cartilage of the fourth rib.

"The apex of the heart, when an individual is standing erect, beats between the fifth and sixth left ribs, about two inches below the nipple, and one inch on its sternal side. But, as the heart is attached only at its base by the large blood-vessels, 'the body of that organ is not fixed in relation to the walls of the chest, but hangs in a certain degree loose,'

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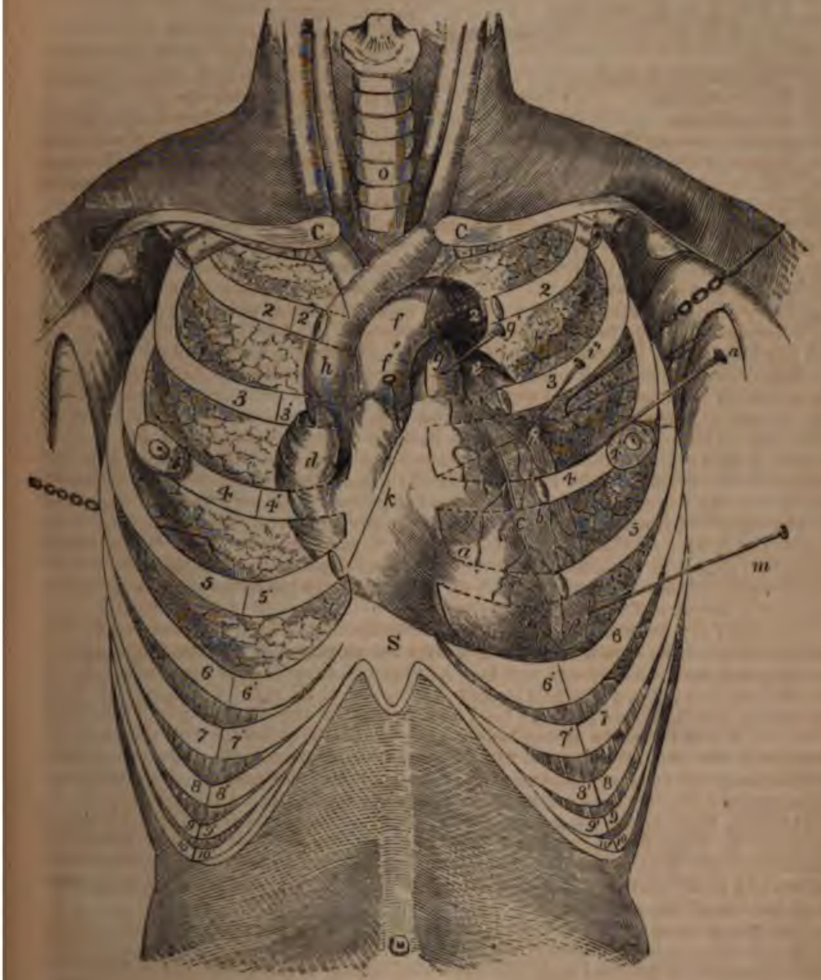
[*] An alteration in the text, suggested by Dr. Pennock.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may be opposite to the apex of the organ. The pulsation is owing to the striking of the small extremity of the heart against the ribs. It has generally been thought to be synchronous with the contraction of the ventricles, and to result from that contraction. According to Hope, during the systole of the ventricles, the apex is drawn somewhat towards the base of the heart, and at the same time tilted upwards and forwards. Various explanations have been given of the mechanism of the movement, one of which refers it to the greater length of the anterior muscular fibres of the ventricles; another to the contraction of the spiral muscles, which, fixed as these muscles are in the tendinous rings about the base of the heart, must have the effect of raising upwards the apex towards the walls of the chest. It has always seemed to me, admitting the impulse to be systolic, that it most probably arises from the reaction of the current of blood in the great vessels, as they proceed from the heart, which must have the effect of projecting that organ forward to a greater or less extent; while the rigidity it acquires in its state of contraction, may give to its contact with the walls of the chest the character of a blow. Somewhat different is the explanation of Dr. Gutbrod, of Germany, previously put forth by Dr. Alderson, of England, that the forward movement is owing to the rebound of the heart, consequent upon the pressure of its own blood, when by the opening of the valves that pressure becomes unequal, exactly on the principle of the rebound of the gun, or the motion of Segner's wheel, which, as a jet of water proceeds in one direction from its circumference, turns in the opposite direction. But the cases are not exactly analogous; for the opening of the heart is into another cavity, upon the walls of which the force is exerted so as still to maintain very nearly an equilibrium. According to either of these latter views, the apex of the heart should be moved somewhat downward as well as forward, which is in fact what the phenomena of the impulse require. But no explanation hitherto given is, I think, quite satisfactory; and, indeed, the question has not yet been definitively decided, whether the impulse really occurs during the systole, or is owing to the expansion of the heart in the diastole.*

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and liable to displacement by change of posture, and by the motions of the chest. Hence, the pulsations of the apex are felt at different points of the chest, and the impulse is affected by the stage of the respiratory act. During full inspiration, the impulse of a healthy heart is scarcely perceptible, but upon expiration, and especially if, at the same time, the body be bent forward, the cardiac pulsations become very forcible."

* In his work on General Pathology, Dr. Alfred Stillé, of Philadelphia, defends the opinion that the impulse of the heart is synchronous with and produced by the diastole of the ventricle, and not, as generally supposed, the systole. The following is a summary of his arguments in support of that view. It is difficult to comprehend how a hollow muscle by contracting could give a blow to a body exterior to itself. When the heart of a frog, which is transparent, is examined, the projection of the apex is found to coincide with the diastole, and its retraction with the systole of the ventricle. In one or two cases in which the human heart has been distinctly seen in action, the ventricular systole was observed to be accompanied by a contraction of the heart in every diameter, and the diastole, which had the rapidity and energy of an active movement, to be attended with a decided projection of the heart downwards. From an analysis by Dr. Corrigan, of Dublin, of a number of cases of ventricular hypertrophy, it appears that in all of them the impulse of the heart was less than natural, and in some could not be felt, proving that the impulse must be owing to some other cause than the ventricular contraction. If cases of hypertrophy of the heart, with increased impulse, are compared with others in which the impulse is diminished, it is found that in the former there is auricular hypertrophy, and in the latter either exclusive ventricular hypertrophy or thinning, and dilatation of the auricle. The want of correspondence, in some instances, between the number of the heart's pulsations and those of the arteries, is best explained by the hypothesis of the diastolic origin of the impulse. This want of correspondence occurs chiefly when the heart is weak, or the mitral orifice contracted. It may be readily conceived, under these circumstances, that the auricle may throw a quantity of blood into the ventricle sufficient to produce the impulse, but insufficient to excite it to contraction, and that two or even

The point at which the apex of the heart strikes, and where the impulse is most distinctly felt, in a state of medium expansion of the chest, and in the

three of these efforts may be made, before the systolic movement which produces the arterial pulsation is effected. (*Elem. of Gen. Pathol.*, p. 319.)—*Note to the second edition.*

These arguments of Dr. Stillé are not without much force; and are supported very strongly by the observations of Dr. Thos. Robinson, of Petersburg, Virginia, and of M. Beau of France. These were made in the cases of new-born infants, in whom the breastbone was wanting, and the heart was exposed to view uncovered by the pericardium. Dr. Robinson's case is recorded in the *American Journal of Medical Sciences* (vol. xi. p. 346, Feb. 1833); and a reference to two similar cases presented by M. Beau to the Academy of Medicine of Paris, will be found in the *Archives Générales* (Avril, 1851, 4e sér., xxv. 499). In the case of Dr. Robinson, the following was the succession of the heart's actions as obvious to the eye. Beginning from a state of rest, the heart suddenly and forcibly dilated in all directions, the dilatation commencing apparently with the auricles, and proceeding with great rapidity to the ventricles. The apex thus elongated was projected forwards, and would of course, in the normal condition of the parts, have struck against the parietes of the chest and produced an impulse. Immediately after the completion of the diastole, and without the least observable interval, the heart contracted forcibly, and was now diminished in all its dimensions, with a receding of the apex. The systole began also in the auricles and proceeded to the ventricles with great velocity. The whole of this complicated movement was made with such rapidity that it almost seemed like one act of the heart, the systole beginning in the auricles at the instant of the completion of the diastole in the ventricles, and altogether occupying less than half a second. A period of rest followed, which considerably exceeded the time occupied by the diastolic and systolic motions combined. In the cases presented to the Academy, the heart, starting from a state of repose, appeared suddenly to dilate in all the dimensions of the ventricle, with projection of the apex, and then immediately to contract without observable interval, the apex retreating; after which came the period of rest.

At a meeting of the *Medical Society of the Hospitals* of Paris, M. Aran stated that he and M. Bernard had performed experiments upon frogs, and young animals at birth, which confirm M Beau's opinions as to the successive actions of the heart; namely, that the auricle, having been passively dilated during the repose, suddenly contracts, thus throwing the blood into the ventricle, which consequently suddenly dilates, and subsequently contracts without any observable interval. Hence, of the two periods of the heart's action, the *first* is occupied by the contraction of the auricle, and the dilatation and contraction of the ventricle, successively; the second by the dilatation of the auricle. (*Archives Gén.*, Avril, 1854, p. 500.)

It seems to me, after the most careful examination of much conflicting statement in reference to the heart's actions, that the theory which most plausibly explains the admitted facts is the following; though I by no means wish to be considered as holding it to be demonstrated. Let us commence with the heart in a state of repose. It is gradually filled, both auricles and ventricles, by the blood received from the veins. This is the *passive diastole*. Though filled, the heart is not distended. From this state of repose it starts quickly into action. The auricles contract, and, immediately afterward, the ventricles, as though stimulated by the auricular impetus, are actively and energetically dilated. This is the *active ventricular diastole*. Instantaneously after its completion, without any interval of time, so that the two actions seem one, the ventricles contract, and send the blood over the body. Then both auricles and ventricles relax, and suffer the blood to enter them passively as before. At the moment of active dilatation the heart strikes against the walls of the chest, and immediately afterward, synchronous with the systole of the ventricles, is the pulse in the carotids. Several physiologists have noticed that the heart of certain warm-blooded animals elongates in the systole; but this contradicts general observation; and it seems to me probable that they may have confounded the active diastole with the immediately following systole; the motions being so quickly performed that they must seem almost as one to the eye, and might readily be confounded. With this view, the observed elongation might be considered as confirmatory of the theory of diastolic impulse.

Since the publication of the fifth edition of this work (A D. 1858), we have had a visit in the United States from Mr Groux, whose congenital deficiency in the sternum has brought the actions of the right auricle within observation. The accounts we had received from Europe, in relation to this case, were so conflicting that they did not tend in any degree to diminish the existing confusion. This idea was expressed in the preceding paragraph in the last edition; but I have subsequently had the opportunity of examining the phenomena presented by Mr. Groux, and found them in a considerable degree to confirm the diastolic theory. On one point it has been necessary to modify the explanation given in the fifth edition, in which, conformably with Dr. Robinson's obsererect position, is between the fifth and sixth ribs, about an inch within and two inches below the nipple, and somewhat more than two inches to the left of the junction between the sternum and xiphoid cartilage, in an individual

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vation, it was stated that, in starting from the period of repose, the auricle and ventricle became suddenly dilated, the dilatation commencing with the auricle. From the examination of Mr. Groux's case, I was convinced that the auricular contraction slightly precedes the active dilatation. The view here given is not that of M. Beau, who, though advocating the diastolic impulse, maintains that the dilatation is produced simply by the contraction of the auricle. It is difficult to conceive that so great a force could be exerted by this structure. The dilatation is, in accordance with the view here supported, as much the immediate result of a power exercised by the ventricle as its contraction. The great difficulty here, on the part of physiologists, is the admission of an active power of expansion. But there is no greater real difficulty in allowing a repulsive power between living particles than an attractive power. Both are constantly exhibited in electrical phenomena, why not in nervous? It appears to me that M. Bernard has demonstrated the existence of an active dilatability in the small blood-vessels. If it exists in these, it may assuredly exist in the heart. But it is said that ordinary muscles do not expand. Certainly they do not, because there is no occasion for it. But the muscles of the heart are not ordinary muscles. They have been shown by Dr. A. Weissmann, of Frankfort (*Arch. Gén.*, Janv. 1862, p. 99), to have a peculiar structure quite different from ordinary muscles; and may they not have been thus gifted in reference to the existence of this very power? It would be a curious object of inquiry, in reference to this assumed property of active dilatability in the heart and the minute blood-vessels, to ascertain whether there may not be some anatomical peculiarity, discoverable by means of the microscope, in which the muscular fibre of the heart and that of the small vessels, while they agree together, differ from the ordinary muscular fibre. If such a coincidence should be discovered it would, I think, be strongly confirmatory of the possession by the heart of an active power of expansion.

I have said above that an examination of Mr. Groux's case has tended to strengthen the view of the diastolic impulse. In the fissure of the sternum is a pulsating tumour, which is generally admitted to be the right auricle. By the ear applied over it the double sound of the heart is heard of its natural character; but I also distinctly perceived another sound, made sensible by slight pressure, closely resembling that of contracting muscle, which satisfied me that it was the auricle that lay beneath. On comparing the beat of the auricle with that of the heart's apex, by means of the sphygmoscope, the former was found to precede the latter by a very slight interval, so slight that it could be made sensible only by the aid of the instrument. By precisely the same interval the auricular impulse preceded that perceptible over the right ventricle. The impulse of the aorta could also be felt, and this was perceived even by the hand to follow the apex-beat. There was a decidedly greater interval between the apex-beat or ordinary cardiac pulsation and that of the aorta, than between the auricular and apex impulses. These statements are made from notes taken at the time. They are confirmed by results obtained by Dr. J. B. Upham, of Boston, and published in the *Boston Med. & Surg. Journ.* (Feb. 3, 1859, p. 15), of which I was at the time ignorant. The observations of Dr. Upham were made in the same case, with the greatest care, and by means of very delicate instruments. According to his statements, allowing 1·000 to represent the whole period of a single pulsation, the portion of this time which elapsed after the impulse of the medio-sternal tumour (right auricle) was 0·038 to the apex-beat, 0·160 to that of the ascending aorta near the arch, and 0·235 to that of the radial artery at the wrist. This succession corresponds with the diastolic impulse-theory. The auricle contracts, the apex instantly afterwards strikes the chest in consequence of the active expansion of the heart that follows, the systole of the ventricle succeeds immediately, and makes itself felt first in the aorta, and afterwards at the wrist. If the apex impulse were owing to the systole, that of the aorta should have followed so promptly as to be quite synchronous to the touch, and certainly not to be separated by an interval representing about one-eighth of the whole pulse-beat, and half the time occupied in reaching the pulse at the wrist. But admitting the systole to have followed the apex-impulse, the time between this and the aortic impulse is increased by that consumed in passing from the active diastole to the immediately succeeding systole, and might well correspond with that given by Dr. Upham, namely, 0·122 (0·160—0·038=0·122), the whole regular pulsation being 1·000.

But, though this view of the heart's actions seems to me most plausible, and it will be found in subsequent notes to explain satisfactorily various seeming anomalies in the morbid sounds of the heart, yet it has not been generally adopted; and I have thought it most expedient to retain in the text the more generally admitted explanations, until the question can be positively determined by multiplied experiment and observation. (*Note to the third, fourth, fifth, and sixth editions.*)

of ordinary size. But this point varies very considerably in health, according to the position of the body, and the stage of the respiratory act. The heart hangs to a certain extent loosely in the cavity of the chest, and therefore yields in some degree to the influence of gravitation. In the erect posture, the apex is about an inch lower than in the horizontal. When an individual lies upon the back, the heart recedes from the walls of the chest, so that the impulse often ceases to be perceptible; when upon the face, the organ falls upon the ribs and makes its pulsation very obvious. The same happens in the position upon the left side, in which the pulsation is often felt to the left of the nipple. During inspiration, the ribs move at the same time forwards and upwards, so as to remove the walls of the chest from the heart, and to lower the position of that organ in relation to any particular rib; and the contrary takes place during expiration. Hence, when the chest is fully expanded, the pulsation is lost or rendered less distinct, and the apex will strike, if at all in contact with the chest, below the sixth rib; while, in a forced expiration, the pulsation is strongest between the fourth and fifth ribs, and may be felt to a considerable extent over the chest, so high sometimes as the third rib. From all this it is obvious that, when the pulsation of the heart is very indistinct, the best means of rendering it perceptible is to cause the patient to lie upon his face or left side, or, if in the sitting posture, to bend forward and to the left, and to exhaust his lungs as far as possible of air.*

The force and extent of the impulse vary greatly, in health, with the varying activity of the circulation, and the thickness of the walls of the chest. In some persons it can scarcely be felt, especially in very fat and phlegmatic individuals; in others again it is very powerful, and may be felt through a large space, as in those who are very thin and of a nervous temperament. In children it is usually more distinct than in adults. After great muscular exertion, it is sometimes violent, and perceptible almost throughout the chest.

The frequency of the pulsations is also liable to great diversity within perfectly normal limits. For the average number in a minute, the reader is referred to the article upon the pulse (see *vol.* i. *p.* 203); under which head are also detailed the causes that occasion diversities in the number without deviation from health, as sex, age, the sleeping and waking state, the time of day, posture, muscular exertion of all kinds, mental influences, and various accustomed stimuli. It is sufficient here to state that the cardiac pulsation, in perfect health, corresponds in frequency with the arterial, as both depend upon the same cause. In the larger arteries the pulse is said to be synchronous with the beating of the heart, in that at the wrist, follows it at a very minute, though still appreciable interval, equal perhaps to one-quarter of a second. There is also in health a fixed relation between the number of respirations and of pulsations, the latter being to the former, according to Dr. Hooker, very nearly as four and a half to one. (See *note*, *vol.* i. *p.* 201.)

In perfect health, the pulsations occur usually at regular intervals, though not uniformly so. In old persons, it is not uncommon to meet with intermissions in the heart's contractions, and some persons are subject to them from infancy, without, in either case, the suspicion of disease. It is a singular fact, often noticed, that in such cases the irregularity is apt to disappear during attacks of fever or other severe illness, and to return with the return of health. Intermissions, however, in the pulse at the wrist are not always a sign of the same state in that of the heart; for it occasionally happens that the ventricular contraction, though sensible near the heart, is too weak to transmit an impulse to the extreme vessels; and the systole may even be so feeble as to occasion a seeming intermission in the beating at the chest. There are, however, frequently true intermissions in the ventricular contractions, without amounting to disease.

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* From an experiment of Dr. J. M. Da Costa, of Philadelphia, it appears that the heart is not only apparently depressed in inspiration, in consequence of the rising of the ribs, but is positively lowered in its position in the chest, being forced downward by the expanding lung. The sternum of a subject having been removed, and the heart and collapsed lung exposed, the lungs were artificially inflated. As the lung rose, the apex of the heart was turned inward, was somewhat lowered, and brought distinctly forward; and the experiment was afterwards repeated with the same result. According to the observations of Dr. Da Costa in the living subject, the point at which the impulse is felt in full inspiration is not only lower down, but further inward, at a spot nearly on a level with the ensiform cartilage, immediately behind the cartilages of the ribs, and varying from three quarters of an inch to an inch and a quarter from the median line. (*Transact. of the Col. of Phys. of Philad.*, N. S., iii. 247–9.)—*Note to the sixth edition.*

The impulse is much and variously altered by disease. It may be morbidly increased or diminished in strength and extent; may be changed in its character; may become more or less frequent than in health; and may suffer irregularities of different kinds in the relation of the successive pulsations. Its *strength* has been generally thought to be *augmented* by hypertrophy or excessive development of the walls of the heart, and by whatever stimulates that organ to excessive action; and sometimes becomes so great as to give the impression almost of a hammer within the chest. It is *diminished*, on the contrary, by weakness of the heart, whether functional or from thinness or degeneration of its parietes, and by whatever tends to remove that organ from the ribs, as adhesions posteriorly, distension of the pericardium, or the formation of a pleural sac anteriorly. It not unfrequently, indeed, happens that the impulse is wholly lost in disease. The *extent* to which it may be felt is increased by excessive action, hypertrophy, or dilatation of the heart; and the increase may be confined to a few inches around the apex, or may embrace almost the whole chest. The heart may be so confined by adhesions, that the point of impulsion against the ribs shall vary less than it ought to do with the varying position of the patient; while, on the contrary, in a distended state of the pericardium, its beating, if felt at all, will be apt to change place more readily than in health, because the organ is no longer restrained in its movements by the investing membrane. The *character* of the impulse is often much altered. Perhaps to this category belongs the short, sharp, quick stroke of irritation, which is wholly different from mere frequency of beat, the former referring to the individual pulsations, the latter to their succession. Instead of resulting from the striking of the apex of the heart against the ribs, the impulse is sometimes produced by the whole organ rising up as it were under the hand, and giving rise to the sense of a slow heaving motion, rather than of a blow.* This happens in dilatation and hypertrophy. In relation to the *repetition* of the impulse, it may become so frequent that it cannot be counted, even exceeding 200 strokes in a minute, or may be reduced even so low as 15 or 20 in the same length of time. The relation of the successive impulses to each other is liable to excessive irregularities. Sometimes a stroke is now and then omitted, either at certain intervals or quite irregularly. In such cases the pulsation is said to be *intermittent.* Occasionally it is as it were *remittent;* one or several strokes being more feeble than those which precede and follow. Not unfrequently the rapidity of succession varies greatly; the pulsations being now very short and rapid, almost running into one another, then again prolonged, slow, and distinct; and all these diversities may be combined in the same case. The double or triple impulse, which is sometimes felt in quick succession, may be owing to as many partial contractions of the ventricle, before the full systole is accomplished. Some have supposed that the diastole is concerned in these irregularities, as there is at that period a sudden and apparently active swelling out

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* It appears to me that this fact is somewhat in favour of the opinion which ascribes the impulse of the heart to the diastole.

As the two sides of the heart act precisely together, the sounds produced by them must be perfectly synchronous, and therefore constitute in fact one sound. It is probable, however, that the sounds produced by the two ventricles are somewhat different; as experiment has shown that, when the muscular walls of the heart are thin, they occasion a clearer and louder sound than when thick; and Dr. Pennock states, as the result of his observations, that the sound of the right ventricle is clearer and more flapping than that of the left.

The sounds of the heart undergo considerable diversity, in a state of perfect health, in their loudness, duration, extent, and relation to each other. They are louder in proportion to the quickness and energy of the ventricular contraction; and are influenced also in this respect by the thickness of the walls of the chest. In very fat persons, they are comparatively feeble and of limited extent; in the very thin and narrow-chested, they are louder and more diffused. The interval of silence is sometimes almost annihilated, when the heart is acting rapidly, under the influence of mental emotion or great bodily exertion. The sounds may also be greatly modified by disease within the thorax, though the heart itself may be perfectly healthy. The extent over which they may be heard is much increased by any cause which substitutes a solid mass, or a collection of liquid, for the cellular tissue of the lungs. They may thus be com-

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mencing with the first and ending with the last of these movements; and its comparative duration may thus be explained, occupying the period of the active diastole and systole, which, according to Dr. Robinson, is about one-third, or perhaps somewhat more, of the whole period from the beginning of one pulsation to that of another. The second sound, in either view, succeeds the systole, and is produced by the closure of the semilunar valves. (*Note to the third edition.*)

An instrument has recently been invented, called the *sphygmoscope* or *cardiascope*, which is calculated to measure the extent of the impulse of the heart and arteries, and to determine the relation as to the time of occurrence between impulses, in separate and even distant positions, as, for example, between that of the heart and of the artery at the wrist. Some of the results obtained by this instrument are given in a paper, read by Dr. S. Scott Alison to the Western Medical and Surgical Society of London. Among the most interesting are the following.

The impulse of the heart is indicated by the rise of the instrument, the diastole (passive) by the fall.

The extent of the cardiac impulse is greatest in children, women, tall and thin men, the nervous and excitable, and those affected with hypertrophy or with this and dilatation of the heart, or in the advanced stage of phthisis. The instrument is scarcely influenced in those who are very fat.

There is usually no pause at the end of the systole, or at that of the (passive) diastole.

The first sound of the heart is synchronous with the ascent of the instrument, the second with the first part of the fall.

The radial pulse, and the pulse in any part of the body, even the most distant, are synchronous with the second sound of the heart, and consequently with the commencement of the (passive) diastole, and the first part of the fall of the instrument over the heart. The inference from this is that the pulse is owing not directly to the systole of the heart, but to the elastic contraction of the aorta.

An important fact is that the pulse beat is conveyed through four feet or more of elastic tube without any loss of time. This proves that an impulse felt anywhere in the body, is positively synchronous with the cause directly producing it, and may have an important bearing on the decision of the question as to the cause of the heart's impulse.

The carotid pulse, as shown by the instrument, precedes that of the radial artery of the wrist. (Pavy, *Med. Times and Gaz.*, Nov. 1857, p. 523.) It must be produced, therefore, by an antecedent cause. This can only be the systole of the heart, sending the blood into the aorta, the wave of which reaches the carotid before it is lost. But the carotid pulse follows by a decidedly appreciable interval that of the heart. (*Ibid.*) It follows that the impulse of the heart precedes the systole, and must be ascribed to the active diastole, which, according to the views given in a preceding note, is very nearly synchronous with the auricular contraction.

The instrument is capable of measuring the extent of movement of the chest in inspiration, and the accordance or non-accordance of these movements in different parts of the chest. For an account of it see the *Med. Times and Gaz.* for Dec. 1856 (p. 656), and for a figure, the same for Nov. 1857 (p. 528).—*Note to the fifth edition.*

effusion, and is of some value as a sign of that affection. The left nipple in such cases is observably more projecting than the right. It is said that a contraction or sinking at the epigastrium is sometimes observed during the contraction of the ventricles. Such a depression may be supposed to result from firm adhesions of the pericardium to the heart, as well as to the parts around it, so that, when the ventricles contract, being fixed posteriorly, they must pull backward the movable anterior parts of the chest.

3. *Signs by Percussion.*

In the ordinary state of the heart and lungs, there is an irregular roundish space, an inch and a half or two inches across, extending from the sternum about the fourth intercostal space towards the left nipple, but without reaching it, in which a portion of the surface of the heart, including nearly the whole antero-superior surface of the right ventricle, a small part of the right auricular appendix, and the outer edge and apex of the left ventricle, lies in contact with the wall of the chest. In this space, percussion is decidedly dull. The dulness, however, is not marked by a precise boundary line, but is gradually shaded off into a clearer sound, as the overlapping portions of the lung become thicker, until at length the pure pulmonary resonance only is heard. Even when common percussion yields a clear sound, the dulness of the most deeply covered portions of the heart may in some degree be brought forth by a stronger blow; and by a delicate ear and practised hand, the outline of the heart may thus be ascertained and chalked out with tolerable accuracy, extending obliquely downward from the third left sterno-costal articulation to a part of the fifth intercostal space about two inches to the left of the sternum, and, in a horizontal line, from the vicinity of the nipple to a short distance beyond the sternum, and thus embracing almost all the lower half of this bone. The sound elicited varies according to the position of the body, and the degree of expansion of the chest in health, and is much affected by different diseases of the lung, pleura, or neighbouring parts, wholly independent of the heart, all of which, therefore, must be taken into account before any practical inference is deduced from the results of percussion. The dulness is greater in the erect position than in supination, and still greater when the body bends forward, or lies upon the face. It inclines also to the side of the body which is lowermost. The affections which interfere with the indications of percussion in complaints of the heart are, on the one hand, those which occasion dulness, such as pleuritic effusion, hepatization of the lung, tumours of various kinds, enlargement of the left lobe of the liver, an overloaded stomach, &c., and, on the other, those which tend to counteract the dulness, as emphysema of the lungs, pneumothorax, and great gastric flatulence. With due allowances for all these circumstances, percussion may afford very useful indications in cardiac disease, by proving the existence of enlargement of the heart, or effusion into the pericardium.

4. *Signs by Auscultation.*

The action of the heart is attended with sounds, which, though not audible under ordinary circumstances in health, become so by the mediate or immediate application of the ear to the chest, and sometimes may be distinctly heard at some distance from the body, not only in disease, but also in certain conditions of excitement, which can scarcely be regarded as morbid. Persons sometimes distinctly hear the sounds of their own heart, so much so, indeed, as to be greatly annoyed by them. In examining these sounds by auscultation, it is best generally to employ the stethoscope, at least when any great nicety of discrimination is necessary; as they are often very limited in their origin, and can scarcely be referred accurately to their several sources, unless

Another frequent cause of the bellows murmur is a watery state of the blood, such as occurs in chlorosis or anæmia. The liquid is in this state more movable, the particles more easily glide over each other; and hence currents are more easily formed by whatever affects the regular movement of the blood. It is in such cases that the bellows murmur is most easily produced by the pressure of the stethoscope upon the arteries; and there can be no doubt that the anemic state very much favours the action of other causes operating in the heart. Indeed, a very watery state of the blood is alone capable of producing the sound, without any change in the capacity of the orifices; the ordinary movements being sufficient, in such a case, to form the requisite currents. In anemic individuals, the slightest increase in the circulation is sufficient to generate the murmur; and, as the anemic state is very apt to be attended with excessive action of the heart, it seldom exists to any considerable extent without this accompaniment. The condition can at any time be induced by free and frequent bleeding.

The roughness implied by the terms filing, rasping, and sawing, is ascribable to inequalities in the surface over which the blood flows, especially in the orifices of the great vessels, produced by depositions of lymph, excrescences of various kinds, osseous or cartilaginous productions, &c. These modifications of the bellows murmur are accordingly in general supposed to indicate organic disease in the valves, or the valvular openings.

Another source of cardiac murmurs is frequently some defect of the valves, either loss of substance, irregular thickening, dilatation of the orifice, or something else which prevents their accurate closure, and thus allows regurgitation of the blood. Among the causes of their inaccurate closure may be mentioned the want of a due proportion of the chordæ tendineæ and musculi papillares to the office they have to perform. It may be supposed that, in these cases, the sound is ascribable not only to the irregularity given to the backward movement of the blood through the insufficient valve, but also in some measure to the conflict of the reverted with the regular current of blood; as, for example, when the blood of the contracting ventricle is sent through the insufficient auriculo-ventricular valve against the current entering the auricle.

The degree of softness or loudness is influenced by the less or greater force of the moving cause; and hence the systolic ventricular murmurs are louder than the diastolic; the former depending on the powerful contraction of the ventricles, the latter on the much feebler elastic pressure of the great arteries. The key or tone of the murmur, according to Hope, is higher or lower, according as the sound is generated at a less or greater depth, by a less or greater force, or in a less contracted or more contracted passage. Roughness of sound is proportionate to irregularity in the surface producing it. The musical tone appears to afford no particular indication. Hope found it most frequently as an attendant upon regurgitation. Any sound may be changed by altering the force of the heart's action. Thus, when the cardiac affection is insufficient to generate a murmur in the ordinary state of the circulation, the sound may sometimes be developed by exciting the heart; and a murmur which, under ordinary circumstances, is smooth, may be roughened by accelerating the current. The quantity of blood, according to Dr. Williams, modifies the murmurs, increasing and prolonging them when excessive, and rendering them loud and short when defective, and attended with excitation of the heart.

By a close examination, it can often be ascertained in which of the valvular orifices the murmur originates, and whether it depends upon obstruction, or upon deficiency of the valves and consequent regurgitation.

In the first place, the seat of the murmur, as perceived by the stethoscope, will tend to fix its origin. When the sound is loudest on the sternum, immediately below the insertion of the third rib, and thence extends upward for about two inches along the course of the great vessels, it may be considered as having its source in the semilunar valves. If the sound be perceived most distinctly along the course of the ascending aorta upon the right, it is probably seated in the aortic valves; if along the pulmonary artery on the left, it is in the pulmonic valves. When the murmur is most distinct over that part of the chest on which percussion is dull, that is, where the ventricles are in contact with the walls, it may be inferred that it is generated either in the mitral or tricuspid valve; in the former, when the point of greatest loudness is a little to the right of the left nipple and an inch or so below it, in the latter, when the analogous point is on or near the sternum in the same horizontal line.

In the second place, the solution of the question, whether the sound depends upon contraction or any other obstruction of the valvular opening, or upon deficiency or insufficiency of the valves themselves, in other words, whether it is generated in the regular onward course of the blood, or by regurgitation, is aided by observing the course of the sound, its relation as to the time of occurrence to the contraction or dilatation of the ventricles, and the character of the sound itself. The course of the sound will generally be in the direction of the current of blood from the originating point. In contraction of the semilunar valves, and insufficiency of the auriculo-ventricular valves, the sound will be synchronous with the ventricular systole; in the opposite states of these valves respectively, with the diastole. The sounds produced during the systole of the ventricle are louder than those during the diastole. *First*, in relation to the *aortic valve*, if it be obstructed, the murmur will be heard during the systole, will be rather loud, resembling, according to Dr. Hope, the whispered letter *r*, and will follow the course of the aorta, sometimes even as high as the carotid, without being perceived, or but faintly so, over the ventricle. If the valve be insufficient, so as to occasion regurgitation from the aorta, the murmur will be heard during the diastole, will be of a lower key than the preceding, resembling, according to Dr. Hope, the word *awe* whispered in inspiration, and will be most distinct over the ventricle into which the regurgitating current from the aorta is directed, though it may also be heard for some distance up the aorta. These two murmurs, succeeding each other, may be considered as a sure sign of conjoined contraction and insufficiency of the aortic orifice. *Secondly*, in relation to the *mitral valve*, obstruction is indicated by a diastolic murmur, heard over the left ventricle, very feeble and low-toned in consequence of the weakness of the auricular contraction and the depth of the valve, and compared by Hope to the word *who* whispered feebly. *Insufficiency*, producing regurgitation, is attended with a louder sound of the same character, is systolic, and may be heard near the apex of the heart, but does not, like the semilunar murmur, extend far up the aorta. *Thirdly*, the same rules apply to the murmurs of the right side of the heart, those namely of the pulmonary semilunar valve, and the tricuspid. They are usually higher toned than those of the left side, because nearer the surface. They will be sought for of course along the direction of the pulmonary artery, or over the right ventricle. They are comparatively very rare. The auriculo-ventricular sounds are sometimes wanting, even when there is considerable constriction of the orifices, in consequence of the feebleness of the auricular contraction. They may occur either immediately after the systole, along with the second sound, in which case they are produced probably, in chief, by the force given to the blood by the suction of the dilated ventricle, or immediately before the systole and after the period of repose, when the contraction of the auricle takes place.*

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* Some modification of these views as to the auriculo-ventricular murmurs becomes necessary, if we adopt the theory of the diastolic impulse. Thus, the murmur often heard near the apex of the heart, synchronous with the impulse, and occurring in the time of the first sound, instead of being regurgitant, and indicating mitral insufficiency, must, on the diastolic theory, be considered as a murmur of contraction, produced by the rush of

It is often very important to be able to decide whether a cardiac affection is organic or merely functional. An accurate appreciation of these morbid sounds is valuable on this account. The pure bellows murmur is an attendant on both forms of disease; but when rough, of the rasping or grating character, it indicates usually some organic derangement of the valves. If the morbid sound be traced to one of the valves, and be found constant there, it may be considered as an almost certain sign of structural change. The murmurs of regurgitation are probably in general of organic origin, though it is possible that regurgitation at the mitral valve may sometimes occur, from a slight irregularity in the contraction of the fleshy columns, consequent upon nervous disturbance; and the same result might readily flow from gouty or rheumatic irritation affecting these columns. The same may be true also of the aortic and pulmonary regurgitant murmurs, if, as maintained by some anatomists, there are muscular fibres in the semilunar valves, the irregular action of which may interfere with their accurate closure.*

A sound similar to the bellows murmur is sometimes caused in the bronchial tubes by the pressure of an enlarged heart. This is distinguishable from the proper cardiac murmur by the fact, that it may be suspended by holding the breath. It may serve sometimes as a sign of disease of the heart, but may proceed from so many other causes, that little reliance can be placed upon it.

A *friction* or *rubbing sound*, analogous to that observed in pleurisy, is often heard in disease of the pericardium, and results from the moving upon each other of the opposite surfaces of that membrane, rendered rough by the exudation of coagulable lymph. It may be distinguished from the similar sound of pleurisy by the fact, that it is not affected by a suspension of respiration. When the membrane is at the same time very stiff and rough, it gives rise to a modification of the friction sound, which has been called *creaking-leather sound*, from its resemblance to the noise made by new leather. Both of these sounds have an alternating character, dependent on the double motion of the heart. They are said to be strongest in the systole, and after expiration. The friction sound often closely resembles the endocardial murmurs; and it is sometimes difficult to distinguish between them. It is generally increased by pressure; but this fact cannot always be received as diagnostic; for, as stated by Dr. Wm. Jenner, even moderate pressure over the base of the heart in children, whose chests are flexible, is capable of producing a murmur by diminishing the cavity of the pulmonary artery. Strong pressure may sometimes even diminish the friction sound, by lessening the movement between the pericardial surfaces.

A *churning* or *washing sound* occasionally results from the presence of a certain amount of liquid in the pericardium. All these pericardial sounds are more superficial than those proper to the heart itself.

A strong pulsation of the heart may develope the mucous and sibilant rales by a movement given to the air in inflamed bronchial tubes, and sometimes occasions the metallic tinkling in large tuberculous cavities.

Sometimes along with the sounds of the heart, whether otherwise normal or abnormal, there is heard a peculiar musical or metallic tinkling, the origin

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blood through the narrowed auriculo-ventricular opening during the active diastole; and the remarks made in the text on the signs of constriction of the auriculo-ventricular openings must be looked on as inaccurate. More will be said on this point under the head of chronic disease of the valves. The author will at present merely observe that the views given in the text are mainly those of Dr. Hope, and were probably originally adopted by that writer as much from their conformity with his opinions in relation to the heart's actions, as in accordance with actual observation. They are, however, allowed to stand; because, though their entire accuracy is doubted by the author, they have high authority in their favour, and those of a different bearing still want the support of further investigation, and the sanction of general opinion. (*Note to the fourth edition.*)

* See an abstract of a paper by Dr. Monneret, presented to the French Academy of Sciences, Oct. 16, 1849, in the *Lond. Med. Gaz.*, March, 1850, p. 408.

of which is not well understood. A similar sound may be at any time produced by applying the palm of the hand to the ear, and gently striking the back of it with the finger. It is noticed under various circumstances, and different explanations have been given. M. Barth has observed it in connection with the existence of air in the cavity of the pleura, and the idea has been suggested that it might in some instances be connected with the gaseous distension of the stomach. It is most probably produced by a quick impulse of the heart, causing vibration in a tense structure, as a similar sound is generated in large cavities with elastic walls containing air. The sound is probably often produced, in various degrees, by a strong impulse of the heart against the walls of the chest. It is of no great importance in diagnosis.

Vascular Sounds.—A slight sound is sometimes occasioned by the motion of the blood in the *arteries*, which is very much increased by whatever roughens the internal surface, or produces any sudden change in the capacity of the vessels, whether aneurisms, or the pressure of a tumour from without. A watery condition of the blood very much promotes it, so much so, that, in anemic individuals, it can be produced with great facility by merely pressing the artery with the end of the finger, or the stethoscope. It is synchronous with the systole of the heart, and consequently takes place during the diastole of the arteries. Sometimes a double murmur is produced in the arch of the aorta, the first corresponding with the systole, the second with the diastole of the heart. The diastolic murmur is supposed to be produced by a regurgitant movement of the blood from the great arterial branches, in consequence of want of due elasticity in the diseased and dilated aorta. (Bellingham, *Lond. Med. Gaz.*, Sept. 1850, p. 399.) Particular attention has been called to murmurs occasionally heard in the pulmonary artery near its origin, and in the subclavian beneath the clavicle, independently of any organic affection of the vessels themselves, and caused generally by pressure from without. Thus, in several cases of tubercles in the lungs, a peculiar, soft, low-pitched murmur was heard by Dr. Da Costa, of Philadelphia (*Am. J. of Med. Sci.*, Jan. 1859, p. 124), situated in the second intercostal space, a little to the left of the sternum, synchronous with the systole, replacing the first sound, confined within a limited space, and ceasing during a full inspiration. This was no doubt produced in the pulmonary artery, somewhat compressed by tubercles in the neighbourhood, though any other tumour in the same vicinity might give rise to it; and Dr. Sieveking, of London, has recorded a case in which the same sound was produced by a cancer in the lung. (*Lancet*, Feb. 11, 1860, p. 135.) The subclavian murmur, so often heard, has been especially investigated by Dr. B. W. Richardson, who found it accompanying chronic bronchitis, phthisis, anæmia, dyspepsia, &c., but frequently also in perfect health, in which case he was disposed to ascribe it to pressure by the overgrown subclavius muscle, as it is peculiarly apt to occur in persons whose occupations require a frequent use of this muscle. (*Dub. Quarterly*, May, 1868, p. 132.)

M. Beau thinks he has proved that the arterial murmur, and especially that of the carotids, is produced whenever an increased wave of blood is thrown into the great vessels, in consequence of dilatation of the heart. (*Archives Générales*, 4e sér., xiv. 133.)

In *large veins*, too, a peculiar murmur has been noticed, especially in anemic individuals, which received from M. Bouillaud the designation of *bruit de diable*, from the name of the humming-top, the noise of which it was supposed to resemble. It may properly be called the *humming sound.* It is observed especially in the internal jugular vein; but occurs also in the external jugular, in the vena innominata, and in the crural vein. (*Arch. Gén.*, 4e sér., xxiii. 326.) It differs from the arterial bellows murmur by being continuous, though it is by no means uniform, having characteristic swells and remissions, which correspond with the diastole and systole of the arteries. Occasionally it has a musical tone. It probably depends upon altered capacity of the vessel at the moment of examination, as by the tension caused by turning the head on one side, and upon a deficient viscidity or abnormal mobility of the blood. Dr. Ogier Ward states that it may be heard in all children under the age of seven, and considers the watery condition of their blood a sufficient explanation. (*Lond. Med. Gaz.*, May, 1851, p. 784.)

5. *General Symptoms.*

These are either directly connected with the heart, or secondary. To the former section belongs the *pulse*, which, though dependent on the contraction of the left ventricle, is not, as felt at the wrist, exactly synchronous with the impulse of the heart, but follows it at a slight interval. Being liable to all the irregularities of the cardiac pulsations, whether as to force, duration, or the relation to each other of the successive beats, it is highly important in diagnosis, and often enables us immediately to detect derangement in the central organ of the circulation. It is almost always more or less deranged in diseases of the heart. Its indications, however, must not be received without allowance. Intermission in the pulse is not always a sign of intermission in the contractions of the heart. It not unfrequently happens that an occasional ventricular contraction is too feeble to transmit an impulse to the arteries in the extremities. The pulse may be very weak when the heart appears to act tumultuously, because, though the extent of the motion is considerable, the force of the contraction is not great; or it may be that the left ventricle may contract, under certain circumstances, less vigorously than the right; or, finally, there may be an insufficient quantity of blood in the left ventricle, consequent upon the retardation of the current in the pulmonary capillaries. Very frequently the heart continues to beat after all pulsation at the wrist has ceased.* Other circumstances which influence the condition of the pulse, independently of the mere cardiac contractions, are the quantity of blood in the vessels, and the general tone of the system. These facts are sufficient to show that the pulse is not to be relied on implicitly, as an index of the state of the heart. Its relation to particular cardiac diseases will be treated of under those diseases respectively.

Dyspnœa is among the most prominent and distressing symptoms of cardiac affection. It sometimes depends upon mere nervous disorder; but more frequently arises from direct interference with the functions of the lungs, either by pressure upon them, congestion, or effusion into the pulmonary tissue or the pleural cavities.

Pain is little to be depended on as a sign of disease of the heart. The most violent and fatal affections are often attended with little positive pain, even pericarditis and endocarditis sometimes running their course without it. In other cases it is very acute; and not unfrequently the patient experiences great distress about the præcordia, of a vague and indescribable character, altogether different from ordinary pain. Though thus uncertain, the existence of pain in the region of the heart should be regarded with suspicion, and lead to an accurate investigation of its cause.

Palpitations, by which are meant pulsations of the heart disagreeably sensible to the patient, are a very frequent symptom. It does not necessarily follow, that there should be an increase of the impulse of the heart against the chest. The symptom is often connected with very slight disease, and becomes alarming only when long continued, or associated with other signs of a serious import. Its existence, however, for any length of time, should always lead to inquiry. Palpitations will be more particularly treated of among the inorganic affections of the heart.

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* These anomalies are perhaps more readily explained on the theory of diastolic impulse. A ventricular contraction, strong enough to produce a perceptible impulse upon the walls of the chest, should cause a pulsation in the artery at the wrist; but we may easily conceive that there may be a diastolic impulse, while the systole is very feeble and insufficient to produce a pulse. Again, the seemingly tumultuous beating of the heart when the pulse is feeble may be diastolic, while the systole may correspond in feebleness with the movement of the artery at the wrist. (*Note to the fourth edition.*)

The *secondary symptoms* are very numerous. They are chiefly such as indicate morbid effects of irregularities in the circulation. Either the blood is driven with too great a force into certain organs, as into the brain in hypertrophy of the left ventricle, and into the lungs in the same condition of the right ventricle; or it becomes congested in various parts, from impediment to its passage through the heart, as in the general venous system of the body, including especially the viscera of the abdomen, when the impediment exists in the right side, or in the pulmonary vessels when in the left; or, finally, it is distributed with insufficient force, or in insufficient quantity, to the body at large, in consequence of debility or obstruction of the propelling organ. Hence the phenomena of active or passive congestion in the brain, the lungs, the liver, the kidneys, and the whole alimentary canal. Hence vertigo, tormenting headaches, irritable temper, epistaxis, apoplexy, pulmonary hemorrhage and inflammation, hepatic disease, hæmatemesis, various forms of disordered stomach and bowels, and an anemic state of the blood. Hence, too, dropsical effusion, sometimes general, sometimes in the form of anasarca or hydrothorax. The enlarged thyroid gland and prominent eyes sometimes connected with disease of the heart, may be similarly explained. It is not pretended that these phenomena occur in all cases of affection of the heart; but there is not one of them which does not occasionally present itself. These symptoms of course vary, according as the congestion is active or passive. Thus, in the former we have the flushed and swollen face, the prominent eye, and the general turgid state of system; in the latter, the pallid or livid complexion, the purple lips, the puffy eyelids, and the universal tendency to œdema. It has been observed that the great viscera are apt to be hypertrophied in consequence of the congestion to which they are incident, and that this effect is produced whether the congestion is active or passive. Besides the sources of secondary disorder above mentioned, there is another, consisting in the pressure of the enlarged organ or distended pericardium upon the neighbouring lungs, and the disturbance of the pulmonary functions from the mere mechanical effect of the heart's frequently excessive action.

It very seldom happens that the whole heart is diseased at once; and when both sides are affected, one is so ordinarily in a greater degree than the other. In like manner, when the two cavities of the same side are diseased, they seldom suffer equally. Not unfrequently the disease is confined to a single valve, or a single cavity.

Article I.

INFLAMMATION OF THE PERICARDIUM, OR PERICARDITIS.

THE heart includes three distinct tissues, which, though frequently inflamed conjointly, are nevertheless liable to be separately affected, and therefore require separate consideration. The tissues alluded to are the pericardium or investing membrane, the endocardium or lining membrane, and the intervening or muscular structure. Inflammation occurring in these several parts is denominated respectively *pericarditis*, *endocarditis*, and *carditis*. These affections were formerly confounded, as no means existed of discriminating accurately between them. Nay, the diagnostic symptoms of inflammation of either or all of these tissues were so uncertain, that the best informed physicians were often at a loss to determine, in particular cases, whether it existed or not. Even Laennec admitted the impossibility of forming a certain diagnosis in pericarditis. To Louis belongs the credit of opening the way to a more accurate knowledge of this complaint, by the discovery of certain characteristic signs. Since his publication, a flood of light has been poured from various sources upon the subject; and we are now in possession of the means not only of recognizing the existence of pericarditis, but of distinguishing it with considerable certainty from endocarditis. The same, however, cannot yet be said in relation to inflammation of the muscular tissue, or carditis, the symptomatology of which, as a distinct affection, is very obscure. The student, in perusing the following remarks, must not forget that, in many, perhaps in most cases of pericarditis, inflammation of the lining membrane exists at the same time, and mingles its characteristic signs with those of the former complaint.

Pericarditis is not unfrequent. It has been inferred from a vast number of post-mortem examinations, made in the hospitals of Paris and elsewhere, that about one in twenty-three of all who die at an adult age, exhibits marks of recent or former attacks of this disease. The proportion is probably greater of persons who are affected with it at some period of their lives; for there is reason to believe that it often occurs, in a moderate degree, without leaving any permanent vestiges behind it. I have no doubt that many slight cases of it are quite overlooked. My attention has frequently been called to attacks of disease, sufficient to unfit the patient for his ordinary pursuits, yet not severe enough to induce him to take to his bed, in which a careful examination has revealed the existence of a greater or less degree of pericarditis.

Anatomical Characters.—The first effect of inflammation of the pericardium is probably to produce congestion, and consequent swelling of the subserous areolar tissue, with diminution of secretion, and dryness of the serous surface. But the first appearance, obvious to anatomical examination, is redness, which may be in points, or in patches or streaks of various shape and size, and, even in the latter case, has a somewhat punctuated or mottled character. Mere redness, however, unattended with effusion, cannot be considered as certainly indicative of inflammation; for it may result from congestion alone, or may be cadaveric. Nor is it always observable in cases of undoubted inflammation, disappearing sometimes in instances of very early death, as erysipelatous redness is known to do upon the skin. Very soon after the commencement of the attack, there is an increased secretion from the internal surface of the membrane. The matter secreted is sometimes almost exclusively coagulable lymph, which concretes as soon as it exudes, sometimes almost exclusively serum, which remains liquid; but in a great majority of cases, is a mixture of the two; the coagulable lymph or fibrinous matter adhering to the surface, and the serum accumulating in the pericardial sac, with flocculi or shreds of the concrete matter often floating in it.

The quantity of the liquid varies greatly, amounting in some instances, to little more than three or four fluidounces, in others to as many pints. Generally it exceeds nine fluidounces. Frank mentions a case in which six pounds of liquid were found in the cavity. Occasionally it is limpid and nearly colourless; but more generally is yellowish or greenish-yellow, opalescent, of a wheylike appearance, or milky; and sometimes is of a red or sanguineous hue. In certain hemorrhagic states of the constitution, it is largely mixed with blood. In some cases, especially in the advanced stages or chronic form of the disease, it is sero-purulent; and rare instances occur, in which, from the peculiar condition of system, it is originally pus, either well formed and nearly pure, or in various degrees sanious and offensive.

The fibrinous matter or lymph is at first generally in the form of a soft delicate film, spread over the surface of the membrane, from which it is easily separable; but occasionally it is deposited in distinct masses. With the progress of the inflammation, it increases in quantity, and at the same time becomes firmer and more adhesive. Its colour is usually yellowish-white, but sometimes pinkish or reddish-brown from the intermixture of blood. It is singularly arranged, not being uniformly spread over the surface, but very irregularly, presenting a reticulated or cellular appearance, which has been aptly compared to that produced by first bringing into contact and then separating two layers of soft butter, spread upon pieces of board or other solid body. The irregular surface of the pericardial exudation is owing to a similar cause. It is, no doubt, produced by the alternate meeting and separating of the cardiac and free surfaces of the membrane, with the alternate dilatation and contraction of the heart. The little prominences and depressions thus formed are altogether irregular in their shape, size, and arrangement. Thus, the surface has been variously compared, in different conditions of the exudation, to that of a piece of cut sponge, to honey-comb, to the interior of the stomach of a ruminating animal, as seen in tripe, and to a congeries of earthworms. Sometimes the pericardium is studded over with soft roundish granulations, and sometimes exhibits innumerable slender papillary projections.

The coating of coagulable lymph or false membrane is of various thickness, from less than a line, to nearly or quite an inch; but in general it is between one and three lines. In some instances, it covers the whole serous surface of the sac, in others, is confined either to the cardiac or to the free surface exclusively, and in others again, is in separate patches very different in their extent. It is commonly thickest upon the heart. Beneath it, the serous membrane is usually reddened, but not always. Dr. Hope states that the pericardium is itself very rarely thickened, and that, when apparently so, it generally owes the effect to a layer of old adherent false membrane, opaque and of a bluish-white colour, the result of previous inflammation. Real thickening, when it occurs, is seated not in the proper serous tissue, but in the areolar or fibrous structure without it. In consequence of the softening of this subserous areolar structure, the true membrane may sometimes be peeled off.

Virchow has noticed in one or two cases of fatal pericarditis, attended during life with great feebleness of the pulse, extreme dyspnœa, anxiety, and ultimately delirium, a state of acute fatty degeneration of the heart; a thickness of one or two lines of the muscular tissue adjacent to the pericardium having been completely changed, while all parts of the heart exhibited more or less of the affection. The occurrence of such a change must add greatly to the danger of the disease, and indicates the prompt application of efficient measures before it shall have had time for development. (*B. and F. Medico-chir. Rev.*, July, 1858, p. 195.)

The anatomical changes which take place in the course of the complaint are not always the same. There is reason to believe that the inflammation sometimes terminates before effusion has occurred, and that in other instances absorption of the effused matter, whether fibrinous or serous, ensues, and resolution is effected. But generally, when coagulable lymph has been exuded, at least in any considerable quantity, the course is different. When the exudation is chiefly concrete, the opposite surfaces, though they may at first separate to a certain extent with every contraction of the heart, gradually, as the lymph hardens and becomes more adhesive, cohere more and more firmly, until they at length remain permanently united. Incipient blood-vessels, in the shape of red points and variously branching lines, soon show themselves in the new deposit, which thus by degrees becomes organized, at first imperfectly, but, through the agency of absorption and the consequent removal of superfluous matter, in the end completely, so as to be converted into areolar tissue scarcely if at all distinguishable from original structure. The pericardial cavity is thus permanently obliterated, and the membrane sometimes appears as though it had never been double.

In those cases, constituting much the greater number, in which the serous effusion is so copious early in the disease as to keep the opposite surfaces separate, adhesion is of course prevented so long as the liquid continues unabsorbed. But, as the inflammation abates, the process of absorption takes place, the amount of serum is gradually diminished, and successive portions of the surfaces, coming into contact, unite together, and go through the same changes precisely as those above described. Sometimes, though rarely, the coating of coagulable lymph becomes organized before the serum is absorbed; and then, after death from other causes, the surface of the heart is observed to be covered, wholly or partially, with false membrane, without obliteration of the pericardial cavity. I have recently seen a case of this kind.

It has been stated that the layers of coagulable lymph are sometimes partial. When two of these patches are opposite to each other, they coalesce, and sometimes unite firmly, so that the sac, instead of being wholly obliterated, is divided into sections which may or may not communicate. But, in other instances, the union is not firm enough to resist the separating action of the heart, and the plastic lymph is thus drawn out into bands or filaments, which, being converted by the organizing process into areolar tissue, continue permanent in the sac. Often, however, the patches are not opposite. In such instances, they are equally converted into false membrane, but now form only whitish opaque spots, which have been frequently noticed, in post-mortem examinations, on the surface of the heart, and were at first mistaken for mere discolorations. Their nature, however, is rendered evident, by dissection, by means of which a lamina of thin membrane may be separated, leaving the proper surface of the pericardium quite distinct. These white patches are of the size of the nail or larger, and, being the remains of former inflammation, are among the proofs of the frequently curable nature of pericarditis.

Sometimes the effused liquid is only partially absorbed, and adhesion, from this cause, but partially effected. This is especially the case when the liquid is purulent, and hence pus is sometimes found, in such cases, filling the intervals of the adhesions. Again the sac may continue long or permanently distended, either from defective absorption, or from the continuance of extravasation. In such instances, coagulable lymph continues to be deposited, so that the coating sometimes at length attains great thickness, exhibiting different layers, which have different degrees of consistence and firmness, the most superficial, as the most recent, being generally the softest. The first layer, becoming organized, serves as an exuding surface from which the next may proceed. Cases of this kind are apt to terminate fatally, but sometimes not until after a long time and various changes. The liquid is occasionally at length absorbed, and the opposite layers, thus brought together, form a thick mass, too unwieldy to admit of a perfect organization. Hence, it is converted into fibrous, or fibro-cartilaginous, and sometimes even into bony matter, which firmly embraces the heart, cramps its movements, and, by offering a constant stimulus to its actions, may end in hypertrophy, or by restraining them, in atrophy of the organ. In tuberculous constitutions, the false membrane sometimes becomes the seat of tubercles. It appears also to be liable to inflammation, and has occasionally been found interspersed with purulent collections.

The substance of the heart is often morbidly affected in fatal cases of pericarditis, being, in relation to colour, redder, browner, or paler than in health; in relation to consistence, harder or softer; in relation to bulk, increased, as in hypertrophy with or without dilatation, or diminished, as in atrophy. When long surrounded by liquid, it experiences the sedative influence of such exposure, and becomes soft, flabby, and pale, with a great diminution of its energy.

Symptoms.—The general symptoms of pericarditis are exceedingly diversified, being very different in different cases, and though, when occurring conjointly in considerable numbers, they may serve to indicate the disease with an approach to certainty, yet they are very seldom conclusive, and often altogether insufficient to serve as the basis of a correct diagnosis.

The attack is usually ushered in with a chill, which is sometimes repeated, and always followed by fever. It is said that occasionally the onset is marked by faintness or positive syncope rather than by chilliness. Among the symptoms which attend the complaint, though by no means always in the same cases, and in some nearly or quite wanting, are pain, oppression, weight or other uneasiness in the region of the heart, palpitations, cough and hurried respiration, dyspnœa, a preference for certain positions, occasional vomiting and painful deglutition, headache and delirium, frequent and often irregular pulse, great debility, attacks of faintness approaching or amounting to syncope, restlessness, anxiety of countenance, and œdema of the face and extremities. From this enumeration of symptoms no definite notion of the complaint can be drawn; and it is necessary to dwell more in detail upon each individually.

Fever is always present, unless in very mild cases, and is attended by the usual signs of this affection in the phlegmasiæ generally, such as frequent pulse, hot skin, sometimes dry and sometimes perspiring, furred tongue, loss of appetite, scanty urine, &c.

The *pulse* is an important symptom. Dr. Todd states that an intermittent pulse, occurring when there is reason to apprehend the supervention of cardiac inflammation, is a very suspicious symptom, indicating the probable approach of either pericarditis or endocarditis. According to Dr. Williams, the pulse is sometimes slower than natural at the commencement; but, unless in the chill, such an event must be very rare. It is usually, after the fever has been fairly established, much increased in frequency, being often from 110 to 120 in a minute, and regular. Early in the disease, it is generally full and strong, with a sharp angry beat; but sometimes it is small and wiry. As the complaint advances, it often becomes irregular, and occasionally very much so, beating rapidly for a few strokes and then slowly, with a sort of hobbling movement, and not unfrequently intermittent. The irregularity is sometimes temporarily developed by excitement of any kind, as by quick motions or mental disturbance. Towards the close, it is small and very feeble, sometimes scarcely to be felt; and this weakness of the pulse at the wrist may be observed occasionally when the heart is apparently tumultuous. It is probable that the irregularity and intermission of the pulse are often owing rather to accompanying endocarditis or carditis, than to the proper inflammation of the pericardium. When it is exceedingly frequent and small, or peculiarly jerking, endocarditis may be strongly suspected. The different condition of the pulse at different stages of the disease may be considered as indicative of the condition of the cardiac muscles; which are at first irritated into excessive action, as shown by the strong, full, sharp pulse; subsequently weakened but still irritated, causing the frequent and irregular pulse; and lastly, exhausted by excitement, so that the pulse becomes more and more feeble till the close. This weakness of the pulse, towards the end, may also be referred in part to the cramping influence of the effusion, liquid or concrete, by which the heart is surrounded. Dr. Stokes has noticed in two cases increased action of the carotids.

Pain is a very uncertain symptom. Sometimes it is exceedingly acute, shooting from the præcordia to the back between the shoulders, and extending often to the left shoulder and down the left arm, sometimes as low as the elbow or even the wrist. It is often aggravated by a deep inspiration or coughing, by percussion, by pressure on the intercostal spaces and in the epigastrium, especially upwards beneath the ribs somewhat to the left of the middle line, by forcible stretching, and by lying on the left side. Frequently, however, sharp pain is wanting, and it has been supposed that it is never experienced, in its severest form, unless the pericarditis is accompanied with pleurisy. This, however, is a mistake; as uncomplicated inflammation of the pericardium has been known to occasion the most excruciating pain. Instead of this sharp pain, the patient very often complains only of a slight, dull, aching, or intermittent pain, or of indefinite uneasiness about the left portion of the chest, variously described as a feeling of tightness or constriction, weight, burning, or oppression, and occasionally involving, to a certain degree, the left shoulder or arm. In some instances, the uneasiness is referred to the epigastrium; and cases occur in which no pain of any kind is experienced, nor any sensation calculated to direct attention to the heart as the seat of disease. The cardiac uneasiness is, moreover, sometimes masked by severer pain in other parts of the body, or escapes notice in consequence of the delirium of the patient. When acute pain is felt, it is generally in the earlier stages, and is diminished upon the occurrence of effusion.

Dyspnœa occurs in most, though not in all cases, and is sometimes very distressing. It is probably in part a nervous phenomenon, connected with derangement of the par vagum; but it arises also from the pain caused by movements of the chest, and from pressure made by the accumulated fluid of the pericardium upon the lungs. Occasionally, it is so severe that the chest visibly heaves in respiration, speaking is difficult, and the patient is unable to rest in the horizontal position, preferring to sit with his body leaning forward and towards the left side. The respiration is in general nearly thirty in a minute, and sometimes much more, especially in cases complicated with pleurisy or pneumonia. The irritation occasionally extends to the diaphragm, giving rise to hiccough, and, as it is said, to the sardonic laugh; but these symptoms, as well as the vomiting, difficulty of deglutition, and derangement of voice which sometimes attend the disease, are with as much probability ascribable to the propagation of disordered impressions through nervous channels.

Cough, though it may attend pure pericarditis, is not a prominent symptom unless in complicated cases. It is usually dry. The *palpitations* are often violent, occurring most commonly in paroxysms, which are apt to come on in the night, and often without apparent cause. Sometimes, however, they are induced by any muscular exertion, or strong mental emotion. *Cerebral disorder* is not unfrequent, being exhibited in headache, disturbed sleep, frightful dreams, delirium, muscular twitchings, &c.; and these symptoms are so severe, with so little obvious cardiac disease, that they have sometimes been referred to inflammation of the brain, and the heart quite overlooked, though dissection has proved the former organ to be sound, and the latter only affected.

A disposition to *syncope* has been supposed to be characteristic of pericarditis. It no doubt occasionally exists, and fainting is sometimes probably the immediate cause of death; but it is by no means a constant symptom. Great restlessness, *jactitation*, *anxiety of countenance*, and general *prostration* are phenomena of bad cases, and especially mark the close of the disease. The peculiar anxious expression is sometimes observed, when there is no pain or other local uneasiness to account for it, and has been ascribed to a nervous influence, propagated through the pneumogastric nerve to the brain, and thence transmitted to the muscles of the face.

Œdema, though more common in the chronic form of the disease, is sometimes observed in the acute, affecting more especially the lower extremities, and owing, in all probability, to the ineffectual action of the heart in the advanced stages, and the consequent venous congestion.

The *blood* in pericarditis almost always presents, when drawn from the arm, the buffy coat and cupped surface of inflammation, in a high degree; and is not apt to lose this character even after copious depletion.

Physical Signs.—These are such as depend either 1. on simple excitement of the heart, 2. on accumulation of liquid in the pericardium, or 3. on the friction of the roughened surfaces of the membrane upon each other.

1. In consequence of irritation propagated to the muscular tissue from the inflamed membrane at the outset, the ventricles contract with increased energy; and, consequently, both the sounds of the heart are louder, and its impulse stronger than in health, and than they are subsequently in the disease. The impulse, however, though regular in its recurrence at this period, is often unequal in the relative strength of the successive pulsations.

2. When the effusion is considerable, dulness on percussion is always observable to a greater extent than in health; and, as the cause is very common, the sign is highly characteristic. It is not usually perceived at the commencement of the disease, nor until it has continued for two, three, or four days; though, in some instances, a copious effusion is one of the first effects, and dulness consequently one of the earliest signs. In extreme cases, it may extend from the edge of the false ribs to within two or three inches of the clavicle, and occupy a space seven and a half inches in height, and nine inches across at the base of the heart. (*Louis.*) Sometimes the diaphragm is depressed by the distended sac, and the stomach and liver displaced. But such instances are extremely rare. When the effusion is moderate, it is best discovered by placing the patient in a sitting posture; because, when upon his back, the fluid is separated by gravitation from the anterior wall of the chest. The dulness is distinguished from that of pleurisy by its position, and its definite outline, and sometimes from that of hypertrophy with dilatation by extending more in the vertical direction. Allowance must be made for turgescence of the heart, which, in the early stage, may occasion some increase of dulness. The percussion sound over the lungs is sometimes more resonant than in health, probably from expansion of the thoracic walls, especially in the young. When the effusion is so great as to produce considerable compression of the lung, the percussion sound occasionally acquires a somewhat tympanitic character as in pleurisy. (A. Hudson, *Dub. Quart. Journ.*, Nov. 1856, p. 285.)

Other signs dependent upon the same cause are the absence of the respiratory sounds over the region of the heart, where they are observed in health, and a diminution of the cardiac sounds, which are feeble and seemingly distant, in consequence of the intervening liquid, and are sometimes scarcely perceptible. But the second sound may be heard with considerable distinctness over the upper part of the sternum, in the course of the pulmonary artery and aorta, because these parts are uncovered, and the sound is generated at the valves of these arteries. The impulse of the heart is also much diminished, and sometimes its pulsations cannot be felt at all. When strong enough to be perceptible, they may often be observed to change their position in consequence of the free movement of the heart in the fluid of the pericardium, and impart an undulatory sensation to the hand, occasioned by the wave of the fluid as it is displaced with every systole. Dr. Latham says that this undulating motion is often visible to the eye between the cartilages of the second and third, or of the third and fourth ribs, or both at the same time; but he has never seen it in any other place. (*Lect. on Clin. Med.*, *&c.*, i. 133.) A common effect of copious effusion into the pericardium is, by pressing the heart backward and upward, to raise the point of impulse, and move it somewhat to the left, so that the stroke is felt behind or even to the left of the nipple, when the patient is on his back. (*Walshe.*) Still another sign dependent upon the effusion of liquid is a prominence of the chest at the precordial region, observable by the eye. This occurs later than the dulness, as it requires a greater amount of fluid for its production. It is often absent; and is most apt to take place in the young, in consequence of the greater flexibility of their cartilages and ribs. Avenbrugger noticed a swelling at the epigastrium as one of the symptoms of the disease; but this is rare. Most of these signs are pointed out by Louis, who thus made a vast advance in the diagnosis of pericarditis. But they will not always answer; for the condition upon which they depend, that namely of a certain amount of effusion, does not always exist. Another sign dependent upon the effusion is a sort of churning sound, which is occasionally produced in the liquid by the movements of the heart.

3. Happily, another set of signs is afforded by cases in which the preceding are not observable. They are the rubbing sounds, produced by the friction of the inflamed surfaces against each other. Attention was first called to the existence of these sounds by M. Collin, but they have since been much more accurately and thoroughly investigated by Dr. Stokes and other observers. They are supposed to depend upon the roughness of the opposed surfaces produced by the coagulable lymph, sometimes possibly upon their dryness in the commencement of the disease. They are almost always double, from the double motion of the heart; and may be triple or even quadruple, as the contractions of the auricles are capable also of producing them. (*Pennock.*) They are generally more distinct with the first cardiac sound.[*] They vary considerably in character, according to the roughness of the membrane, and probably also its stiffness or consistence, as well as to the energy of the heart's contraction. The ordinary form is that denominated simply *friction sound*, which is very similar to the friction sound of pleurisy and is sometimes so soft as to resemble the bellows murmur. The harsher forms are designated sometimes by the epithets *grating*, *rasping*, &c. Occasionally the sound imitates the rustling of crumpled parchment. As the varying circumstances which modify the sound may all exist in the same case, so may also the different varieties of the sound. As first observed by M. Collin, it had a creaking character like that made by new leather, and this form of it is hence called the *creaking-leather sound*.

The friction sound is not heard at the very commencement of the inflammation, but usually becomes sensible early in the disease, when the pericardial surfaces are not yet separated by liquid effusion, and have not contracted adhesion. It is then owing either to the dryness of the membrane, or the thin coating of coagulable lymph, and generally in all probability to the latter. When the effusion is slight, the sound should be sought for about the base of the heart, near the centre of the sternum. Moderate pressure with the stethoscope will sometimes develope it, when not otherwise sensible. Adhesion of the pericardium, or separation of its surfaces by the liquid effused, soon abolishes it more or less completely. Sometimes it may be made to return, after having ceased, by causing the patient to lean forward, and thus throw the fluid towards the apex. When lost in consequence of adhesion, Williams states that it is last heard below the left breast. The sound is occasionally audible only over particular portions of the pericardium, independently of adhesions or the presence of fluid. Hence it has been inferred that the membrane is liable to partial inflammation; and the same inference has been drawn from the white patches now and then observed upon the heart; but, though the fact may be true, it requires other proofs than those mentioned; as the whole membrane may be inflamed, and yet concrete exudation take place only in parts of it.

The friction sound, lost in consequence of copious effusion, is again heard after the liquid has been so far absorbed as to permit the surfaces to come once more into contact. But here again its duration is brief; for the surfaces soon contract adhesions, and cease to move upon each other. It is, therefore, to be sought for in the earlier, and in the somewhat advanced stages of pericarditis, and answers an admirable purpose as a supplement to the signs derived from effusion, being present more especially under the circumstances in which these are wanting.

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[*] If the diastolic impulse be admitted, the first friction sound would occur during the active dilatation and the immediately succeeding systole, while the second would be confined to the period of slow passive dilatation from the vis a tergo. In this view the greater distinctness of the former can be readily understood.

There is some risk, unless with due attention, of confounding the friction sounds with the valvular murmurs which indicate the existence of endocarditis. Skoda states that, according to his experience, there is no endocardial murmur, except the whistling, which may not be imitated by a friction sound; and he knows no distinctive sign except that the internal murmurs correspond with the rhythm and the natural sounds of the heart, while the external follow its movements. (*Treat. on Auscult. and Percus.*, Lond. ed., p. 219.) But the friction sounds are more superficial than the endocardial, are rougher, especially when coincident with the second sound of the heart, are more apt to change their position, are inaudible at the distance of two or more inches up the pulmonary artery or aorta, where the murmurs of the sigmoid valves are heard distinctly, and are not, like the murmurs of the auriculo-ventricular valves, uniformly loudest near the apex of the heart. (*Graves, Hope, Stokes.*) They do not, like the endocardial murmur, replace the normal heart-sounds. Besides, along with the friction sound, there is often a vibratory tremor distinctly felt by the hand placed over the region of the heart; and this is said by Dr. Hope to be generally stronger than the analogous thrill, sometimes attendant, in a slight degree, upon the valvular murmurs. Dr. Stokes observed it in five out of six cases. He considers, as an important diagnostic character between the friction sound and the valvular, the fact that the former is very rapidly modified and often removed by local treatment, as by leeching or cupping, which has comparatively little effect upon the latter. Another distinction is that the friction sound is increased by pressure, which has in general little effect on the endocardial murmurs. (*Sibson.*)

Dr. Latham declares that the friction sound is in general not altered nor abolished by the effusion of serum; and that it may often coexist with the dulness, and is sometimes even preceded by it. By change of position, the cardiac surface may generally, however great the effusion, be brought at some point or another in contact with the free surface, and thus give rise to friction. He ascribes this remarkable difference of the relation of the friction sound to the dulness in pericarditis and pleurisy, to the firmness of the heart contrasted with the yieldingness of the lungs. (*Lectures on Clin. Med., &c.*, i. 129.)

There may be some danger of confounding the friction sound with the mucous rales of bronchitis in the parts of the lungs lying over the heart; but the latter cease when the breath is held, while the former continues unabated. When the friction is strong, it may absorb the natural sounds of the heart, and thus lead to the suspicion that these are wanting. But the latter may always be perceived, under such circumstances, by applying the instrument to the upper part of the sternum.

The loudness and roughness of the friction sound must not be taken as a measure of the amount of plastic exudation; as, with a weak action of the muscles, there may be little of the sound though the exudation is copious.

Dependent on the same cause as the friction sound are the parietal vibrations, which communicate a thrilling sensation to the hand applied to the chest over the region of the heart.

It has before been stated that, in a very large proportion of cases, endocarditis coexists with pericarditis. In these, of course, both the friction sounds and valvular murmurs will be produced, though the latter may often be masked by the former. In relation to the valvular murmurs as signs of inflammation of the endocardium, more will be said under that disease. One cause, probably, of the frequent coincidence of these two affections is the thinness of certain parts of the cardiac walls, as in portions of the right auricle, and around the orifices of the aortic and pulmonary valves, where the investing and lining membranes come very nearly in contact, so that inflammation may readily pass from one to the other.

Air has, in some very rare instances, been found to exist in the pericardial cavity, being either secreted, or introduced from the stomach or lungs by a fistulous opening. It produces crackling, coughing, and metallic sounds very different from those ordinarily noticed, and sometimes so loud that they can be heard at a great distance. (Stokes, *Dis. of Heart and Aorta*, p. 37.)

When adhesion of the pericardial surfaces has taken place, there are no signs by which it can always be certainly recognized. Dr. Hope considers a peculiar jogging motion of the heart as characteristic of it; but his views upon this point are not generally admitted. When there is, at the same time, adhesion between the external surface of the pericardium and the pleura anteriorly, the obscurity is not so great. The heart, as observed by Dr. Williams, is then tied to the chest, in contact with which it must remain, whatever may be the motions of the ribs. Its movements, therefore, may be seen, and its impulse felt more distinctly than under ordinary circumstances, the intercostal space being drawn in at each contraction; and the site and distinctness of the pulsation, and the dulness on percussion, do not vary with the position of the patient, or with the respiratory movements. Dr. Sanders has observed, in cases of close adhesion, each contraction of the ventricle to be attended by a depression in the left portion of the epigastrium; and such an event may be readily conceived to occur, if the pericardium shall have also contracted adhesions posteriorly. According to Skoda, this is not true of the epigastrium, at least he has not seen it; but, when the lower half of the sternum is retracted during the systole, it is a certain sign of adhesion of the pericardium to the heart, and to the vertebral column also. Skoda states, as the result of his observation, that the apex of the heart, though it may seem to cause a shock during the diastole, gives no systolic beat in pericardial adhesion, being prevented from moving downward and to the left, and drawn on the contrary to the right and upwards. When, along with this absence of the systolic beat, there is retraction of the left intercostal spaces over the apex or above it, the existence of adhesion is indicated. (Markham, *Diseases of the Heart*, pp. 114–15.) In two cases of universal pericardial adhesion, Prof. Freidreich, of Heidelberg, noticed, along with the retraction of the chest during the systole, a striking tumefaction of the veins of the neck, and with its subsequent elastic rebound during the diastole, a complete collapse of those vessels, so that they could no longer be seen; the blood being forcibly driven out of the chest in the former condition, and drawn into it in the latter. There was no impulse against the chest in the systole, but, on the contrary, along with the elevation of the walls, a decided diastolic shock. (*Arch. Gén.*, Déc. 1864.)* The most characteristic sign of adhesion is probably a continuance of the limits of dulness on percussion over the heart, unchanged by changes in the position of the body.

Course and Termination.—In some violent cases, the disease has been known to run its course in a very short time, and to terminate fatally in less than forty-eight or even thirty hours. But such instances are extremely rare. Sometimes it is of a moderate grade and protracted march, running on for several weeks, without, however, entirely losing its acute character. But in ordinary cases which terminate favourably, the disease generally begins to yield in the course of a week or ten days, and sometimes much sooner under active treatment. The fluid now begins to be absorbed, as shown by the diminishing dulness, the increasing sounds of the heart and respiration, the returning friction sounds, &c.; adhesion soon follows; and the cure is completed in less than three weeks. In slight cases, the cure may take place still sooner, and without adhesions. If about to prove fatal, the complaint is marked with great general weakness, oppression, and anxiety; the pulse is very frequent, small, feeble, irregular, and at length scarcely to be felt; the extremities are cold; the face is pale, wan, and haggard, with purple lips; delirium not unfrequently comes on; and life at last closes, sometimes in the midst of convulsions. Occasionally, death occurs suddenly, without any premonition, under circumstances in which there was no apparent danger of such an issue. It is probably always the result of a direct loss of power in the muscles of the heart.

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* This retraction of the apex of the heart during the systole seems confirmatory of the diastolic theory of the impulse; especially when considered in connection with the diastolic shock observed by Skoda and Freidreich under similar circumstances.

Symptoms of Chronic Pericarditis.—Under the name of chronic pericarditis are included long-protracted cases of the acute disease which have lost their original violence, and certain other cases of a slow progress, which have been of the same mild grade from the beginning. These are often attended with pain, either dull or sharp, in the vicinity of the heart, sometimes extending to the left shoulder or arm; but the pain is in general only occasional, and seldom very severe. Not unfrequently, too, the patient is without pain, and complains only of oppression, stricture, or weight. There is usually more or less shortness and quickness of breath, and disturbance of pulse, the latter being somewhat more frequent than in health, and often irregular, but almost always feeble and irritated rather than strong and active. It is occasionally hectic. The breathing is sometimes so much oppressed that the patient lies down with difficulty. Prominence over the region of the heart, dulness on percussion, absence of the respiratory sounds, distance and feebleness of those of the heart, and deficiency of impulse, are even more constant symptoms than in the acute form. The friction sound may also be occasionally heard. The face is usually pale and puffy, and the lips purplish; and I have seen the whole surface of the same dark hue. An anasarcous condition of the extremities is very common. The patient is not usually confined to his bed; and often continues for months, alternately better and worse, until at length the disease takes a favourable turn, or carries him off. Death is often sudden. The disease may terminate in three or four months, or may run on much longer.

The only affections with which this is likely to be confounded are dilatation of the heart, and dropsy of the pericardium. The former is usually attended with an extended and peculiar impulse, and even increased loudness of the cardiac sounds, and never with the noise of friction. When the cardiac muscles, however, are very feeble, the contractions may scarcely be sufficiently strong to produce sound. In such cases, the very gradual origin and very slow progress of the disease will be sufficiently diagnostic. Dropsy of the pericardium is without local pain or febrile action, and may usually be distinguished by the coexistence of a universal dropsical tendency.

The anatomical peculiarities of chronic pericarditis have already been detailed. Its causes, so far as they can be distinguished from those of the acute form, are an impoverished or depraved condition of the blood, feebleness of the general powers of the system, and a scrofulous or tuberculous diathesis. Tubercles are occasionally found in the pericardial tissue.

Causes of Pericarditis.—The ordinary causes of inflammation are capable of producing it in the pericardium. One of the most frequent direct exciting causes is exposure to cold, when the body is warm and perspiring. Direct mechanical violence, fatiguing muscular effort, strong mental excitement, the abuse of stimulating drinks, suppression of hemorrhages or other morbid discharges, and the retrocession of erysipelas or other eruptive affection may also produce the disease. I have seen it result apparently from the cure of psoriasis by local applications. It is an occasional attendant on the exanthematous fevers. But pericarditis occurs more frequently, beyond all comparison, as an attendant upon acute rheumatism than from any other cause, or, perhaps, all others united. It is asserted by some of the highest authorities, that at least one-half of the cases of acute rheumatism are accompanied with pericarditis, endocarditis, or the two conjointly. Of 186 cases of acute rheumatism observed by Dr. Latham, 18, or between a seventh and an eighth of the whole, were affected with pericarditis, either alone or in connection with endocarditis. (*Lect. on Clin. Med.*, i. 144.) It has been disputed whether the cardiac affection in these cases is the result of metastasis, or is simply a part of the rheumatic disease. This appears to me to be very much a dispute about words. In rheumatism, it is well known that different parts, whether internal or external, are often affected successively, the inflammation leaving one seat as it fixes itself in another. It is also well known that many parts are often affected simultaneously. So it is in the case before us. Sometimes the rheumatic inflammation, when it seizes the membranes of the heart, is relieved in the limbs; and, under these circumstances, is said to be the result of metastasis. Sometimes it exists conjointly with the external affection, and occasionally may even precede it. Though the connection between rheumatism and pericarditis has long been known in Great Britain and this country, yet the profession is undoubtedly indebted to Bouillaud, in a considerable degree, for our present much more precise knowledge of the subject. Formerly the disease was supposed to be only an occasional incident in the course of rheumatism; now it is known to be a very common accompaniment. Pleurisy and pneumonia probably often give rise to pericarditis by the direct propagation of inflammation from tissue to tissue. It is not unfrequently associated with Bright's disease of the kidneys, and has been ascribed to the ureous impregnation of the blood attendant on that affection. It has been traced, moreover, to the impure state of the blood denominated purulent infection, because supposed to be owing to the absorption of decomposed pus or sanies, from suppurating centres in other parts of the body. In such cases, it has been found associated with purulent deposits in the muscular tissue of the heart. (Dr. W. S. Kirkes, *Med. T. and Gaz.*, Oct. 1862, p. 431, &c.) Under these circumstances, the symptoms are those of an adynamic or typhoid state of the system, the course is more rapid, and the termination more apt to be fatal than in ordinary cases. The disease appears also to have sometimes occurred epidemically in confined localities.

Among the predisposing causes, age must certainly be counted. The disease is much more prevalent in early than in advanced life. Persons between eight and thirty-five are thought to be peculiarly predisposed to it. Sex also has some influence. Men are more frequently affected than women. The disease is more apt to attack persons of vigorous constitution than the feeble and delicate. The rheumatic and gouty diathesis, convalescence from exanthematous diseases, especially scarlatina and erysipelas, and the existence of hypertrophy and dilatation of the heart, are undoubtedly predisposing causes; and the same is asserted of pregnancy and the puerperal state.

Diagnosis.—The diseases with which pericarditis may be most readily confounded are endocarditis, pleurisy, pneumonia, and pleurodynia. From the first it may be distinguished by the dulness on percussion, the prominence of the chest, the absence of the respiratory sounds, and the faintness or distance of those of the heart, or, in case of the want of these signs, by the existence of the friction sounds and the purring tremor, and the absence of the valvular murmurs. From *pleurisy* it is distinguished by the more precise outline and peculiar position of the dulness, and its not changing with the posture of the patient, by the situation of the friction sounds, which accompany the heart's actions and not the movements of respiration, and by the absence of ægophony. *Pneumonia* may occasion dulness on percussion in the same region, but it is without the projection of the chest, the friction sound, and the altered cardiac sounds; while it presents symptoms of its own not found in pure pericarditis, such as the rusty and viscid sputum, the crepitant rale, and the bronchial resonance and respiration. *Pleurodynia* is without any of the physical signs mentioned as characteristic of pericarditis, and is also usually unattended by some of the most prominent of its general symptoms, such as chill and fever, anxiety of countenance, oppression, irregular pulse, faintness, &c. The only coincident symptoms are acute pain, tenderness on pressure between the ribs, and difficulty of respiration. It must be great carelessness which would confound the two affections.

But some embarrassment might be experienced in distinguishing pericarditis, when associated, as it often is, with the febrile phlegmasiæ above mentioned, especially with pleurisy and pneumonia of the left side. In the case of complication with pleurisy, the existence of the pericardial inflammation would be indicated by the friction sound over the heart existing independently of respiration. If this should be wanting, the general symptoms would aid much in deciding the point. Thus, should pain be felt over the heart, dulness and prominence exist in that region, and the cardiac sounds be feeble and distant, though these signs might arise from pleurisy, yet, if the pulse were very frequent and irregular, the countenance very anxious, and a tendency to syncope, with palpitations and distressing dyspnœa observable, there would be every reason to suspect the existence of pericardial inflammation. In pneumonia, a coexisting pericarditis would be indicated by the friction sounds, prominence of the præcordia, greater flatness on percussion here than elsewhere, and by faintness and remoteness of the cardiac sounds. The general symptoms would here also aid the diagnosis. Indeed, the supervention of increased fever, with an irregular pulse, oppression, dyspnœa, palpitation, &c., in a case of pectoral inflammation, would afford strong ground for suspecting that pericarditis had set in, and should lead to a careful examination of the heart. In cases, too, of apparent cerebral affection, and of general inflammatory rheumatism, the practitioner should always be on his guard, and direct his attention to the præcordial region, upon the occurrence of the slightest suspicious symptom.*

Prognosis.—This is generally favourable. The disease was formerly considered very dangerous, because recognized only in its worst forms. In the great majority of cases, it is a mild affection, and often wholly escapes notice in cases of inflammatory rheumatism, getting well under the treatment addressed to the disease in general. Not unfrequently, in all probability, it would subside spontaneously, like so many other inflammations, under a proper regimen, as relates to diet, rest, &c. Simple cases of pericarditis rarely prove fatal. It is when complicated with pleurisy and pneumonia, and when occurring as an attendant upon other diseases deeply involving the constitution, as Bright's disease and purulent infection, that it becomes so dangerous as it has generally been supposed to be. There is no doubt, however, that, even in its simplest form, it is capable of destroying life, and, therefore, requires prompt and energetic treatment. It is most fatal when supervening upon organic affections of the heart, and occurring in persons worn out by previous disease.

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* A case is recorded in the *Dublin Quarterly Journal of Medical Science* (viii. 241), in which a rough crackling friction sound, heard over the region of the heart, and accompanying the motions of that organ, was supposed, in connection with other symptoms, to indicate the existence of pericarditis, but after death was found to depend on emphysema of the anterior mediastinum. The pericardium was perfectly free from inflammation. The sound was produced by the pressure of the dilating heart upon the emphysematous structure. (*Note to the third edition.*)

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its abuse. The application of the remedy is to be guided upon the same principles as in other cases of serious inflammation. The stimulating quality of the blood should be reduced by depletion, and the direct sedative effects of its loss upon the heart obtained, without pushing it to the point calculated to promote reaction. The theory which urges to any amount of risk, in order to avoid the terrors of adhesion, should not be allowed the least weight.

From a robust individual of previously unimpaired health, and at or near the commencement of the attack, from twelve to twenty-four ounces of blood may be taken at first, and the operation repeated, once and again, during the three or four succeeding days, if justified by the strength of the pulse, and the unchecked progress of the disease. After the first bleeding, which ought to be carried so far as to produce a decided impression on the pulse, but without inducing syncope, it is usually advisable, upon the recurrence of the excitement, to attempt its reduction by cups applied over the region of the heart, so as to abstract from eight to twelve ounces. The general bleeding can afterwards be repeated if this should not answer. In persons debilitated by previous disease, or ordinarily of a delicate or anemic constitution, blood must be drawn more sparingly; and, in many cases of this kind, it is best to rely upon local depletion. It is generally advisable, after cups or leeches, to cover the præcordia with an emollient poultice, care being taken to protect the moistened surface from exposure to cold air.

At the commencement of the treatment, the bowels should be thoroughly evacuated by some active cathartic, as, for example, by three or four compound cathartic pills, or a dose of infusion of senna with sulphate of magnesia, or from ten to fifteen grains of calomel, followed in a few hours by castor oil or Epsom salt. Afterwards, throughout the complaint, it will be sufficient to keep them open once or twice daily by saline laxatives or enemata if necessary.

After reducing sufficiently the excitement of the pulse by depletion, and thoroughly evacuating the bowels, we are next to have recourse to mercury with the view of affecting the system. This is inferior only to the lancet in importance, and, in certain cases in which the propriety of depletion may be doubtful, will bear off the palm even from that remedy. The union of opium with the mercurial is beneficial, not only by obviating any tendency which the remedy may have to run off by the bowels, but also by restraining the violence of the heart's action. In pericarditis, every contraction of the heart tends to aggravate the disease, by keeping the inflamed part in motion. Opium renders it in some measure insensible to the irritation from the inflamed membrane, and consequently has a tendency to diminish the frequency of its contractions. During the existence, however, of the fever, it is best to qualify its stimulant action by combining it with a nauseating diaphoretic. These various indications will be met by giving from two to four grains of calomel, or from six to twelve grains of mercurial pill, with half a grain or a grain of opium, and double the quantity of ipecacuanha, every four hours. Or, the mercurial may be given with the opium alone, and, instead of the ipecacuanha, small doses of tartar emetic, as the eighth or sixth of a grain, may be given every hour or two. Should the skin be hot and dry, a tablespoonful of the neutral mixture, or a dose of the effervescing draught, or from five to ten grains of nitre, may be given with each dose of the antimonial, or without it if ipecacuanha be preferred. In conjunction with these measures, hot pediluvia may be employed daily. So soon as the gums are affected, the quantity of the mercurial should be moderated; but the impression should be sustained for ten days or two weeks, or until convalescence is established. Should difficulty be experienced in affecting the gums, the external use of mercury may be conjoined with the internal; and, for this purpose, a drachm of the mercurial ointment may be rubbed on the insides of the extremities once

It may always be considered very dangerous when attended with a very frequent, irregular pulse, great dyspnœa, large effusion in the pericardium, and the general signs of imperfectly circulated, and badly aerated blood.

There are two modes of favourable termination, one and the most favourable in resolution, the other in adhesion. Some authors, however, have maintained that adhesion is only a temporary cure; and that sooner or later it almost always, if not always, leads to dangerous and even fatal lesions of the heart. Dr. Hope strenuously advocated this view. He believed that, among other effects, in consequence of the constant struggle of the muscles of the heart under the constraint of the adhering membrane, hypertrophy and all its terrible results ensue. This may be true in relation to some of those cases in which the effusion of coagulable lymph has been very copious, and in which an imperfect organization has been effected into a stiff, fibrous, or fibro-cartilaginous envelope. But I am quite convinced that it is not true as a general rule; and the opinion is combated by the best French authorities. Louis and others have observed, in their dissections, numerous instances of old pericardial adhesions in persons who have died of other complaints, and in whom there was no suspicion of cardiac disease during life; and at present the weight of authority, even in Great Britain, is in opposition to the views of Dr. Hope. Pericardial adhesion is probably scarcely less innocent in relation to the heart, than the pleuritic in relation to the lungs.*

Treatment.—Bleeding is undoubtedly the most important remedy in the earlier stages of acute pericarditis. Yet it is not to be employed indiscriminately and unsparingly in all cases. Great loss of blood indirectly stimulates the heart. The blood is rendered so thin and watery that it is incapable, as ordinarily distributed, of supplying the wants of the system; and such are the sympathies of the heart, that a sense of this deficiency, transmitted everywhere from the periphery of the circulation to the nervous centre, excites, on every occasion calling for an increased expenditure of blood, excessive action in that organ, in order, by a more rapid current, to compensate for the defective quality of the fluid. Hence, any existing tendency to hypertrophy or dilatation is greatly promoted; and one of the very objects aimed at, that, namely, of quieting the heart, defeated. It is certainly possible to push the depletion beyond the point of reaction; but this would scarcely be safe, in reference to immediate results. Besides, when the pericarditis depends on rheumatism, as it usually does, bleeding alone will not generally subdue the inflammation; and the heart is thus left to struggle with the irritation of the disease, and the indirect irritation of the remedy. There is, under such circumstances, should the patient survive, great danger of organic disease of the viscus. These are not arguments against blood-letting, but only against turpentine in quantities sufficient to induce irritation of the urinary passages, in order to promote the absorption of the exuded coagulable lymph; and states that iodide of potassium has been used advantageously with the same view. The alkaline carbonates and bicarbonates are also occasionally employed. Narcotics are often required, in connection with the other remedies, to control nervous irritation, relieve pain, and produce sleep. The diet must vary with the condition of the patient. When the system is debilitated and the blood impoverished, animal food should be permitted; and it may sometimes be advisable to allow a cautious use of the fermented liquors.

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* In an essay on pericardial adhesions by Mr. Henry Kennedy, contained in the *Edinburgh Medical Journal* (May, 1858, p. 986), a statement is given of 90 cases of adherent pericardium, without valvular disease, in 34 of which the heart was healthy, and in 56 diseased; the disease being pure hypertrophy in 25 cases, hypertrophy with dilatation in 26, and atrophy in 5. Now these facts appear to me to prove that simple adhesion of the two faces of the pericardium can produce no serious mischief to the heart; as otherwise one-third of the cases would not have been exempt from all disease. There can be no doubt that the existence about the heart of masses of organized exudation, perhaps of ligamentous, cartilaginous, or bony consistence, would prove injurious by cramping the heart, and thereby provoking excessive muscular effort, which must end in the production of hypertrophy; or, if the heart were unable to react, might occasion atrophy. Adhesions, moreover, to the surrounding structures, must have the same effect, by giving the heart so much more to do than naturally belongs to it. The probability is that many of the cases of hypertrophy above referred to had their origin in these causes, and not in simple adhesion, which may be considered as nearly innocent; but it is also probable that, in most of the cases of coexisting hypertrophy and adhesion, the two conditions had no etiological relation, but a common origin in rheumatism, which is a well-known cause both of hypertrophy and pericarditis. (*Note to the sixth edition.*)

In cases originally chronic, the same general plan of treatment may be employed; but in these cases moderate venesection may be occasionally called for; care being always taken not to induce an anemic state of the blood. The remedy, however, upon which our main reliance must be placed is mercury, judiciously but perseveringly employed. The mercurial pill is usually preferable to calomel under these circumstances, as less liable to disturb the stomach and bowels. Should there be a reasonable suspicion of tubercles in the pericardium, and symptoms of a somewhat hectic character presented, the mercurial should be superseded by cod-liver oil and iodide of potassium.

Paracentesis has been employed in some desperate cases; and, though the patients generally died afterward, there is no reason to suppose that death resulted from the operation. In some cases, decided relief was afforded. In a case recorded by M. Trousseau, the effusion did not return for nearly two months during which it was under observation. (*Arch. Gén.*, Nov. 1854, p. 531.) M. Aran has also reported a case, in which the operation was twice performed, and each time followed by injection of iodine, not only without injury, but with great relief to the patient; and, after the second injection, the fluid did not again accumulate to any considerable extent. It would certainly be justifiable to puncture the pericardium, in cases where the effusion is so abundant as to put life in imminent danger, and all other means of relief have been tried ineffectually.

Article II.

INFLAMMATION OF THE ENDOCARDIUM, OR ENDOCARDITIS.

ENDOCARDITIS is inflammation of the interior or lining membrane of the heart. For much of what is known of the disease, we are indebted to M. Bouillaud. Others were aware of the fact, that the inner surface of the heart is sometimes the seat of inflammation; but the frequency of the affection, its rheumatic origin in most cases, and its fatal influence in the development of organic changes in the heart, were first clearly ascertained by the author mentioned.

Anatomical Characters.—Inflammation leaves behind it, in the internal membrane of the heart, much less prominent characters than in the external. The reason of this is obvious. Exuded fibrin, serum, and pus, the ordinary results and evidences of inflammation, are in this affection generally carried away from the diseased surface, as fast as thrown out or generated, by the incessant current of the blood. Hence, perhaps, it was that endocarditis so frequently escaped the notice of pathological anatomists. Redness was visible; but this, being frequently the result of cadaveric imbibition, or of the same process in the last stages of life, has now long been considered as in itself but a very equivocal proof of the existence of inflammation, and certain only when accompanied with other evidences. These, however, though not very obvious, have revealed themselves to the more careful search of recent observers; and the frequent existence of endocarditis is now universally admitted.

or twice in the day, and any blistered surface that may exist may be dressed with it daily. The course here recommended is applicable to severe cases. When the symptoms are mild, or are yielding to depletion, the mercurial should be employed more sparingly, or altogether omitted.*

After three or four days, should effusion have taken place, a large blister should be applied over the præcordia, and repeated after the surface heals, if the symptoms continue. It is often proper in this stage, when there may be some uncertainty as to the sufficiency of the reduction, to apply cups or leeches again; and this may be conveniently done between the shoulders, in order to avoid interfering with the blistered surface.

At this period of the disease, also, colchicum will sometimes be found useful, when the complaint is of rheumatic origin. Should the pulse be very frequent, it may be proper to control it by means of digitalis. To meet the two indications, when coexisting, twenty or thirty drops of the wine of colchicum root, and ten or fifteen of the tincture of digitalis, may be given every four hours; and, in cases of much nervous irritation, the addition of one of the narcotic tinctures, as that of hyoscyamus or conium, in pretty full doses, may be beneficial. Aconite, camphor, and hydrocyanic acid have been recommended, under similar circumstances; and American hellebore would probably also be very useful by reducing the pulse.

Perfect rest of body and composure of mind, throughout the complaint, are of the utmost importance. The patient should be sedulously guarded from the influence of causes calculated to excite him in any way; and all unnecessary persons, therefore, should be excluded from the apartment. The diet should in the early stage consist of mucilaginous or farinaceous liquids, and animal food should be avoided up to the period of convalescence. Cooling drinks may be given throughout the complaint.

In the form of pericarditis attendant on chronic Bright's disease or purulent infection, or occurring in the advanced stages of other exhausting affections, it is very obvious that general bleeding and mercury are contraindicated. Tonic and stimulant measures are here often necessary to support the system; and repeated blistering, preceded by cupping when the strength permits, is the chief measure to be relied on for the relief of the inflammation. Opiates may also be employed freely, when there is no special contraindication, as stupor, for example. As in all other inflammatory diseases, in the advanced stages, when the powers of the heart are failing, and death from prostration is imminent, it is necessary to support life by stimulants and nutritious food.

In *chronic pericarditis*, it is advisable to sustain a slight mercurial impression; to keep up a constant succession of blisters over the heart; to apply occasionally, in case of pain, a few cups or leeches between the shoulders; and, when the effusion is copious, to employ the diuretics, especially squill, digitalis, and bitartrate of potassa. Some have recommended, instead of blisters, pustulation by tartar emetic, or the employment of a seton or issue; but it is doubtful whether these are in any respect preferable to the former remedy. Bouillaud applies ten grains of the powder of digitalis daily to the blistered surface, when the heart continues to act excessively; but the remedy requires very cautious watching, lest it produce too great depression. Dr. Joy proposes turpentine in quantities sufficient to induce irritation of the urinary passages, in order to promote the absorption of the exuded coagulable lymph; and states that iodide of potassium has been used advantageously with the same view. The alkaline carbonates and bicarbonates are also occasionally employed. Narcotics are often required, in connection with the other remedies, to control nervous irritation, relieve pain, and produce sleep. The diet must vary with the condition of the patient. When the system is debilitated and the blood impoverished, animal food should be permitted; and it may sometimes be advisable to allow a cautious use of the fermented liquors.

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* It must not be denied that the current of opinion has been setting, to a certain extent, against the use of mercury in pericarditis; and many are disposed to doubt its efficacy who have had little experience of its effects; but my own opinion, based not only upon the experience of others, but of my own, of the efficiency of mercury in this, as in other inflammatory affections, remains unchanged; and, consciously, I have never known the remedy do harm in these cases; but I wish the reader to observe that I am altogether opposed to the reckless use of mercury in inflammatory affections, and consider it inapplicable to cases in which the blood is depraved, as in those associated with uræmia or pyæmia. (*Note to the sixth edition.*)

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Redness in points, arborescent ramifications, or patches gradually fading into the general hue of the membrane, may be observed more especially about or upon the left valves, and not unfrequently extending into the aorta. The reddened membrane is often thickened, is sometimes also softened, and occasionally presents roughness, inequality, or a whitish opacity of the surface, consequent on the exudation of fibrin into its substance or beneath it. Concrete fibrinous matter, notwithstanding the current of the blood, may generally be found in small quantities, either adhering to the valves and the membrane in their neighbourhood, or entangled in the meshes of the columnæ carneæ. (*Bouillaud.*) Sometimes it exists in the form of a filmy layer, but more frequently in granulations, from the size of a small shot to that of a pea. These granulations are either of crude lymph, or in various stages of organization; and are supposed to be the origin of the fungous or warty excrescences, called vegetations, which have often been observed in the same position. Watson speaks of them as disposed generally upon the semilunar valves, in the shape of two crescentic rows, one on each side of the central *corpus aurantii*, and extending thence to the point of insertion of the valve. These curved lines correspond with the edge of the fibrous structure, which is enclosed within the fold of serous tissue constituting the valves, but does not reach to the full extent of the duplicature, and leaves, consequently, a small portion of the membrane thinner and translucent, like the section of a plano-convex lens, the two points of which terminate respectively at the central corpuscle, and the place at which the valve is inserted. The rubbing of these thin portions of membrane against each other, at every closure of the valve, appears to displace the lymph that may be exuded upon their surface, and to cause it to accumulate, in the lines alluded to, like a festoon of minute beads. In the auriculo-ventricular valves, upon the same authority, the exudation is arranged either in the shape of serrations upon the free edge of the laminæ, or in a continuous line near it. In more advanced cases, the laminæ of the valves are sometimes seen adhering to the surface of the heart, sometimes to one another by their edges; causing in the former instance imperfect closure, and in the latter more or less obstruction. Besides being deranged in the modes above described, the valves are liable to be puckered up, and in various degrees distorted, and their tendons to be contracted, so as to interfere with the free movement of the blood through them, or, from imperfect closure, to admit of its regurgitation.

Another source of embarrassment to the circulation in endocarditis is the formation of fibrinous coagula directly from the blood, which are supposed to contract adhesions to the lining membrane, at any accidentally rough or prominent point, and may be seen twisting about the fleshy columns, and valvular tendons. (*Bouillaud.*) These are of various magnitude, whitish, elastic, and adhesive, analogous to the buffy coat of inflammatory blood, and apparently capable of an imperfect organization. Indeed, Laennec ascribed the origin of the warty vegetations, before mentioned, to these coagula. They are stated sometimes to enclose a nucleus of exuded fibrin. Dr. Gerhard considers them as more frequently the cause than the effect of endocarditis, and ascribes their origin to that highly fibrinous condition of the blood which characterizes inflammatory diseases generally. Sometimes they are so attached as to be movable in the cavity, and may thus at one time interfere with the passage of the blood, and at another leave the valvular openings free. In this way we may account, in part, for the fact, that the sounds which indicate derangement of the valves are not always constant, even in cases of permanent organic disease; and that the most alarming symptoms of cardiac obstruction, in cases of heart disease, sometimes come suddenly on, or as suddenly disappear, without any discoverable cause.

It is said that ulceration, and even gangrene, have been observed as the sibly owing in part to a turgescence of the walls of the heart, but probably much more to a distension of the cavities by the accumulated blood. The dulness in this case may be distinguished from that of pericardial effusion, by the sounds of the heart being louder and less distant, and by the impulse being more superficial, as well to the sight as the touch, synchronous with the first sound instead of fluctuating, and confined to one spot instead of moving from point to point of the chest. Nor is there, in this case, complete absence of respiration in the region of the heart.

But incomparably the most valuable physical sign is the *bellows murmur*. This is usually perceived in a prolongation of the first sound, and, when combined with symptoms of an acute febrile disease, uneasiness in the præcordia, palpitation, and a frequent small pulse, all occurring in a person previously in good health, may be considered as quite characteristic of endocarditis. If rheumatism exist at the same time, there can scarcely be a doubt as to the nature of the complaint.* The murmur proceeds, in these cases, from partial obstruction or defective closure of the valvular orifices, or from both causes conjoined. There is reason to believe that a spasmodic contraction of the columnæ carneæ, attached to the auriculo-ventricular valves, may sometimes contribute to the production of the sound, by preventing a closure of the orifices during the systole of the ventricles. But, with the symptoms above mentioned, such a contraction would itself be an evidence of inflammation of the lining membrane. The murmur is sometimes soft, sometimes in various degrees rough or harsh, and sometimes musical. It is occasionally so powerful as entirely to mask the ordinary sounds. Both sounds of the heart may be attended with the murmur in the early stages; but, when the cavities have become greatly congested, the second sound may be nearly or quite lost, and regurgitation cannot take place in a sufficient degree to occasion a murmur. In the general remarks upon the morbid cardiac sounds, the reader will find some rules for ascertaining whether the murmur is from a contracted passage or from regurgitation, and in which of the valves it may be seated. But great skill in auscultation, and an acute ear are necessary for a correct decision; and, after all, the points to be decided are of no great practical importance; as they do not affect the treatment. In the great majority of cases, the murmurs have their origin in the left cavities of the heart, which may therefore be considered as the most frequent seat of endocarditis; and it has been observed that, in relation to the valves, the aortic and mitral are simultaneously affected in by far the greater number of cases, and, when they are separately affected, that the mitral is much more apt to suffer than the aortic. (Barclay, *Medico-chirurg. Trans.*, xxxv. 10.)

It has been before stated that this affection is very often associated with pericarditis. Their coexistence may generally be inferred, if the valvular murmurs are heard in connection with the signs peculiar to the latter disease.

Causes.—These do not materially differ from the causes of pericarditis, to the account of which, therefore, the reader is referred. Occasionally endocarditis occurs as an original affection; but it is much oftener an accompanibefore the valves are much affected, there may be frank open fever, with a pulse strong, full, and excited, without being extraordinarily frequent. At no period is there severe pain, unless the affection is complicated with pericarditis or pleurisy; and, according to Bouillaud, pure endocarditis is in no degree painful. There is, however, almost always more or less uneasiness about the region of the heart, and a feeling of anxiety which is often expressed upon the countenance. When the valves have become so much thickened, or in other modes deranged, or coagula have formed so largely as to interfere with the proper movement of the blood, a new and alarming train of symptoms sets in. Stimulated not only by the inflamed membrane, but also by the impediments offered to the circulation, the heart contracts with excessive rapidity, so that the pulse not unfrequently amounts to 140, and occasionally reaches 150, or even 160 in a minute. At the same time, though the heart appears to act tumultuously, the pulse is extremely small and feeble. It is often also unequal and irregular, with occasional intermissions, which, when not dependent upon a correspondent intermission in the cardiac pulsations, may be caused by a deficiency in the quantity of blood expelled from the ventricle. Another condition of the pulse is sometimes observed, which is connected with the existence of regurgitation through the aortic valve. The impulse produced by the ventricular systole is propagated to the artery at the wrist with unimpaired force; but this is not sustained as in health by the entire effect of the elastic contraction of the aorta, which is now partly expended in a backward direction. The blood, therefore, appears suddenly to glide away from beneath the fingers; and the pulse has a peculiar quick jerking feel. When either an excessively frequent, or this peculiar jerking pulse, occurs in a case of pericarditis, it may be strongly suspected that the inner membrane is also inflamed.

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There is another possible source of endocardial murmur, which is worthy of consideration, though not sufficiently established by positive proof to justify us in allowing it at present great practical weight. It is well known that the blood is very highly fibrinous in acute rheumatism, and is consequently disposed to deposit fibrin. Now it is not impossible that, in many of the supposed cases of endocarditis, as indicated by the valvular murmurs, the phenomena may be due simply to such a deposition of fibrin on the surface of the valves, without any inflammation whatever. See remarks on this subject by Mr. Simon, in the *American Journal of Medical Sciences*, N. S , xx. 477, extracted from the *London Lancet*. (*Note to the third edition.*)

Various other symptoms result from the altered movement of the blood in the heart. They proceed from two distinct sources, namely, from a deficient supply of arterial blood to the system at large, and from a congestion of the venous blood. The contracted or otherwise obstructed orifices do not permit enough blood to pass them; or if the defect be an insufficient closure of the valves and consequent regurgitation, that which has passed them returns in part upon its course, and consequently is not distributed in ordinary proportion through the body. The same causes which impede the onward movement of the arterial blood, occasion an accumulation of the venous blood behind; whence ensues congestion in the right cavities, in the lungs, in the great venous trunks, and in fact in all the great organs, and to a certain extent in the whole venous system. Hence, in the worst cases, great debility, faintness sometimes amounting to syncope, an almost cadaveric paleness or lividness of the surface, cold sweats, extreme anxiety, great restlessness and jactitation, and a most distressing sense of impending suffocation. The venous blood in the brain sometimes occasions mental wandering, drowsiness or stupor, and even convulsions; the same cause in the portal circle gives rise to various evidences of gastric and hepatic derangement; and the universal venous congestion produces in the end a more or less general œdema.

In some cases, however, it is asserted that most of these symptoms have occurred without any signs of mechanical impediment to the circulation, and merely in consequence of imperfect or deranged innervation.

Physical Signs.—Early in the disease, the impulse of the heart is felt much more strongly, and to a greater extent over the chest, than in health; and this strong impulse often continues after the pulse has become small and weak. At length, however, the muscular power of the organ is exhausted, and the impulse becomes feeble.

There is usually a greater extent of dulness on percussion than in health, sometimes, according to Bouillaud, over twice as great a space. This is possibly owing in part to a turgescence of the walls of the heart, but probably much more to a distension of the cavities by the accumulated blood. The dulness in this case may be distinguished from that of pericardial effusion, by the sounds of the heart being louder and less distant, and by the impulse being more superficial, as well to the sight as the touch, synchronous with the first sound instead of fluctuating, and confined to one spot instead of moving from point to point of the chest. Nor is there, in this case, complete absence of respiration in the region of the heart.

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The evidences of inflammation above mentioned are unequivocal. But not unfrequently portions of the heart exhibit increased redness or other discoloration, with softening or induration of the muscular tissue, without purulent infiltration, abscess, or ulceration; and, as these characters have been observed as the result of inflammation in other muscles, they are probably so in this, though the conclusion has not been universally admitted. A fact, very strongly confirmatory of their inflammatory nature, is their occurrence in cases of pericarditis and endocarditis, in the more superficial part of the muscle in contact with the inflamed membrane; while the interior of the muscular wall is sound. There are, however, instances of softening, which, as they exhibit no other sign of inflammation, and occur especially in feeble cachectic states of the system, are probably dependent upon diseased nutrition rather than upon inflammatory action. Induration, supposed to be the consequence of chronic inflammation, has been repeatedly noticed; and sometimes the muscular tissue has degenerated, possibly under the influence of the same process, into something like cartilage or even bony matter.

Wherever inflammation of the substance of the heart has been observed, it has, thus far, been almost always associated with the same condition of the investing or lining membrane, or both together. Such an affection as independent carditis, of any considerable extent, has not yet been proved to exist.

The *symptoms* of carditis are, therefore, necessarily intermingled with those of pericarditis and endocarditis. Nor can they be discriminated. When signs of proper cardiac inflammation have been observed after death, there have generally been, during life, pain in the præcordia or epigastrium, a frequent, irregular, fluttering pulse, much dyspnœa, anxiety, faintness, and great prostration, with cold sweats, &c. Sometimes death has been very speedy, sometimes protracted. It is highly probable that the peculiarly irregular and feeble pulse so often an attendant upon pericarditis and endocarditis, occasionally depends on inflammation of the substance of the heart, which is thus necessarily much disturbed in its actions. It is not impossible that the sudden death which sometimes occurs in these affections may be the result of an acute carditis; the muscles of the heart losing their power of contraction, just as those of the intestines, which are equally involuntary muscles, are known to do under similar circumstances.

The physical signs are equally fallible with the general symptoms, in the diagnosis of proper carditis. All pathologists agree as to the impossibility of distinguishing it from the membranous inflammations. It may, however, be suspected to exist, when, along with other symptoms of cardiac affection, the pulse becomes very frequent, irregular, intermittent, and fluttering, with faintness, dyspnœa, anxiety, and prostration, without any bellows murmur indicative of endocarditis and consequent obstruction in the heart, and without the signs of considerable pericardial effusion.

The *causes* of carditis are the same as those of pericardial and endocardial inflammation. Persons in whom the evidences of the affection have been discovered upon dissection have usually been the subjects of rheumatism.

In relation to the *treatment*, there is absolutely nothing in which it differs from that of the two affections mentioned. Indeed, it would not be amiss, in a practical point of view, to treat of pericarditis, endocarditis, and carditis as the same disease, under the name of inflammation of the heart; but the nicety of modern pathology requires that discrimination should be made; and, if we cannot better cure the disease, we are likely at any rate to have more precise ideas as to its nature and effects; and ultimately, perhaps, even therapeutics may be benefited.

Article IV.

CHRONIC VALVULAR DISEASE.

CHRONIC disease of the valves of the heart is frequent, and of very serious import. Those of the left side are much oftener affected than the right. From an examination of 400 cases of valvular disease, Dr. Hope inferred that the proportion of disease in the right valves was about 1 in 20. Dr. Clendinning found it once in every 16 cases, out of 100 which came under his notice. The causes of this discrepancy are not very obscure. The greater power of the left ventricle must cause a greater strain upon the valves; and, in relation to the auriculo-ventricular valves, the mitral, being accurately closed while the tricuspid is supposed to remain partially open during the systole, may feel the strain in a still greater degree.* It is known, too, that the left side of the heart is much more liable to endocarditis than the right, and this affection is a copious source of valvular derangement. Possibly the greater predisposition to inflammation may be owing, in part, to the more stimulating character of the blood of the left cavities. The fibrous tissue in all parts of the body is peculiarly susceptible to the kinds of degeneration with which the valves of the heart are most commonly affected; and, as this tissue is more abundant about the left than the right valves, because required to support the greater muscular action, it follows that the former will be more subject to disease than the latter. Sometimes valvular derangement exists in both sides at the same time; in which case it is almost always worst in the left. Of the several valves, the aortic have been said to be most frequently diseased, next the mitral, and after these the tricuspid; those of the pulmonary artery being very rarely affected. But, from a table prepared by Dr. E. L. Ormerod, it appears that, in 132 cases, the mitral valves were diseased in 104, the aortic in 85, the tricuspid in 14, and the pulmonary in 6. (*Lond. Med. Gaz.*, March, 1851, p. 507.)

Anatomical Characters.—The morbid changes in the valves or their orifices are numerous. They may be merely thickened without any other alteration of structure, and retaining the natural consistence. This is the least serious of their diseases, and, unless followed by other changes, is usually of no great importance. Their edges may unite together by adhesive inflammation, so as very much to narrow the aperture through which the blood passes. Their laminæ may, from the same cause, contract adhesions with the neighbouring surface, and thus prevent the possibility of closure. The tendinous cords and fleshy columns with which the valves are connected, sometimes become shortened and thickened, and sometimes elongated; in the former case injuriously restraining their motion, in the latter permitting them to move too freely. In either case, the orifice is not accurately closed.

But a much more frequent affection is a degeneration of the fibrous tissue, which enters into the structure of the valves, and forms a sort of ring about their openings, thus giving them strength, and affording a tendinous attachment for the muscles. This undergoes the same changes as are often observed in the same tissue in other parts of the body. It is first thickened and indurated, and afterwards converted successively into fibro-cartilage, proper cartilage, and something similar to bone. The orifices are thus diminished in various degrees by cartilaginous or osseous rings, or by irregular masses projecting from their edges; and the laminæ of the valves become stiffened, and not unfrequently very much distorted, so that they are no longer susceptible of accurate adaptation, and therefore cannot fully close. At first, the surface of the serous membrane external to these morbid structures is quite smooth, and the membrane may even be separated from the cartilage unaltered. But the growth appears at length to become irregular, giving a rough, tuberculated, or variously corrugated outline to the new tissue, and causing prominences of a corresponding shape upon the serous surface. Instead of this conversion of tissue, there is not unfrequently a deposition underneath the serous membrane of new matter, generally of a calcareous character, either in the form of small plates, or of irregular granules, which in some instances coalesce so as to form considerable masses. In consequence of the pressure of this foreign matter, the membrane occasionally inflames, and is ulcerated or absorbed, leaving the calcareous surface bare. Steatomatous matter is sometimes formed instead of calcareous, producing ulceration, and sometimes considerable destruction of the valves. In some cases, these conversions of tissue and depositions are confined to the fibrous tissue about the orifice, in others to the valvular laminæ; sometimes affecting exclusively the base of the valves or their free border, leaving the central portions sound, and sometimes the whole structure. The stiffness and brittleness of the altered tissues cause the valves occasionally to give way to the force of the blood, and thus fissures and ruptures are produced. Ulcers, too, arise from the inflammation excited by the morbid masses, and cause openings through the valvular laminæ, or even separate them partially from their connections, so as to cause them to hang loosely in the heart's cavity.

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* It is denied by Valentin that the tricuspid valve is thus imperfect in its action. He declares, as the result of careful experiment, that its several laminæ are exactly adapted to each other in the systole of the ventricle, so that frequently not a drop of blood escapes into the auricle. (*Lehrbuch der Physiol. der Menschen*, Band i. s. 425.)

Excrescences, as remarked under endocarditis, frequently form on the surface of the valves, or neighbouring parts, sometimes few and isolated, sometimes thickly studding the membrane, of all dimensions, from that of a minute granule to the size of a pea, or even a large bean, and occasionally clustering so as to form irregular cauliflower tumours. Some of them are soft and fleshy, others warty and almost cartilaginous. Their colour is whitish, or presents some tint of yellow, gray, or red. They arrange themselves preferably along the edges of the valves, or at their base. The surface of the membrane beneath is often diseased; and their formation is probably owing either to exudation from this surface, or to the adhesion of fibrinous coagula from the blood.

Another organic affection of the valves is atrophy or wasting of their tissue, which sometimes proceeds so far as to reduce them almost to a gauze-like texture, and occasions openings through them, by which the blood is permitted to pass, and regurgitation produced.

When the heart is much dilated, the valvular openings are enlarged in the same proportion; but it sometimes happens, from their morbid state or other cause, that the valves themselves retain their original dimensions, and are thus insufficient to effect complete closure of the orifices.

Causes.—The causes of these valvular affections are different. The most common is undoubtedly inflammation, either acute or chronic, and generally of rheumatic origin, or connected with granular disease of the kidneys. From this cause probably arise hypertrophy and adhesions of the valves, the various conversions of the fibrous tissue, and most of the excrescences upon the surface. Sometimes, however, the cartilaginous and bony degenerations appear to be independent of inflammation, occurring under the same influences as those which produce ossification of the arteries, especially in old people. It is probable that calcareous depositions have, occasionally at least, the same origin as the chalk stones in the joints of persons long subject to gouty affections. Atheromatous depositions or conversions probably proceed from the same failure of vital force which gives rise to fatty degeneration elsewhere. Excessive and continued action of the heart, by straining the valves, has a tendency to produce hypertrophy and induration of their tissues, if not ultimately the cartilaginous and osseous conversions. Violent straining or other excessive muscular effort occasionally produces rupture of the valves or their tendons, and especially when the tissue has been previously rendered brittle by disease. Finally, an impoverished condition of the blood, or other depravation of health, may give rise to atrophy of the valves; though it is not impossible that this affection may also sometimes proceed indirectly from inflammation. Dr. Williams states that he has observed it in the greatest degree upon the right side of the heart, in which inflammation is least common.

Effects.—A moderate degree of disease of the valves may exist without materially impairing their efficiency, and consequently without giving rise to any serious results. This may continue indefinitely with little or no change, or may increase more or less rapidly, and occasion at last the most distressing and fatal consequences.

The office of the valves is to open before the current of the blood passing in the legitimate direction, and to close against its return. If unable to perform this duty, it is clear that they must occasion serious disturbances in the circulation. In the first place, contraction of the orifice, or any morbid derangement or change in the structure of the valves which impedes the passage of the blood, must produce accumulation in the cavities and vessels behind the point of impediment, while the supply is morbidly deficient to all the parts in front of it. Thus, constriction of the mitral valve must occasion congestion of the left auricle, of the pulmonary veins, and, if considerable, even of the pulmonary arteries, the right cavities, and the whole venous system; while the left ventricle, receiving less of the blood than is essential to the due performance of its office, is deficiently stimulated, and consequently falters in its actions, and the whole arterial system suffers. So also constriction of the aortic orifice, or any impediment there, causes congestion of the left ventricle, and may occasion, when considerable, a somewhat deficient supply to the arteries generally; but the ventricle is stimulated to increased contraction by the presence of the unusual quantity of blood, and is thus enabled, when the constriction is moderate, to obviate the latter consequence in a great degree.

Secondly, an imperfect closure of the valves, when it is their duty to close, must allow regurgitation of the blood, and thus, in a different manner, produce the same results as constriction, namely, accumulation behind and deficiency in front. Besides, it brings forces to bear upon parts which they were not intended by nature to act upon, and necessitates new modifications of these parts, either as the direct result of the pressure, or in order to enable them to sustain it. Thus, insufficiency of the mitral valve must permit the force of the left ventricle to bear in some measure upon the walls of the left auricle, where, as well as in the lungs, the right cardiac cavities, and the veins generally, there must be accumulation; and, just in proportion to the excess of blood in this direction, must be its deficiency in the arteries. A similar condition of the valves of the aorta occasions regurgitation from that artery into the left ventricle during its diastole, resulting both from the elastic contraction of the aortic coats, and, as some suppose, the active expansion of the heart. The ventricle is thus congested, and peculiar effects are produced upon the arteries by the sudden collapse of the current after its first vigorous impulse.

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It is easy to conceive what must be the result of similar changes in the valves of the right side of the heart, and the complicated effects of coexisting derangements of the different valves, or dissimilar derangements of the same; for it is very possible, and, indeed, not unfrequently happens, that a contracted aperture and imperfect power of closure exist in the same structure.

But the irregularities of the circulation thus produced are not the only, nor the worst effects of diseased valves. The increased stimulus applied to the muscles of the heart, and the increased pressure within its cavities, give rise to excessive growth of the one, and excessive distension of the other; in other words, to hypertrophy and dilatation. These are almost uniformly, sooner or later, the result of any considerable disease of the valves, and consequently very much complicate the morbid effects which flow directly from that cause. These affections and their modes of production will be considered in a subsequent article.

A remarkable coincidence between valvular disease of the heart and the existence of cataract has been observed by Mr. T. F. Jordan, of Birmingham, who, in about twenty cases of the latter affection, found clear evidence of the former, and out of three times the number in which the chest was examined, states that in no one "could a perfectly healthy condition of the heart be confidently affirmed to exist." (*B. and F. Med.-chir. Rev.*, Am. ed., April, 1857.) Mr. Jordan is disposed to consider the cataract as a result of the cardiac disease. It appears to me that the two are more probably the coincident results of a common cause, as, for example, rheumatism, and those conditions of the general health which favour the various degenerations of tissue.

General Symptoms.—The general symptoms of diseased valves are so intimately associated with those of hypertrophy and dilatation, that it is difficult, if not impossible, accurately to discriminate between them, or to decide, in all cases, how much is to be attributed to the one, and how much to the other cause. I shall, therefore, postpone a full account of the symptoms until we reach these latter diseases. There is no doubt, however, that disease of the valves is capable, of itself, and before the production of hypertrophy or dilatation, of giving rise to obvious morbid phenomena, among which are the results of sanguineous congestion on the one hand, and of a deficiency of blood on the other. Very often the patient complains of some pain or uneasiness about the region of the heart, extending not unfrequently to the left shoulder and arm, and occasionally even to the fingers. In some cases, this pain is lancinating and severe, occurring in paroxysms, similar to the attacks of angina pectoris; but this is probably owing less to disease of the valves than to coexisting neuralgia of the heart. Perhaps, most frequently, it is only a vague sense of oppression, which is converted into positive pain, with a feeling of weight or tightness at the sternum, upon any considerable excitement of the heart from muscular exertion or other cause. There is usually, also, more or less dyspnœa, and occasional palpitation, which are rendered more obvious, and sometimes distressing, by any considerable exercise, such as running, or ascending heights. The pulse is often much deranged; and this is among the first symptoms by which attention is called to the state of the heart. The character of the pulse, however, varies much with the valves affected. Upon this point, the remarks of Dr. Hope are valuable. According to that author, in disease of the mitral valves, whether it impedes the flow of blood by contraction, or allows of regurgitation from imperfection, the pulse is "in various degrees small, weak, irregular, intermittent, and unequal." This, indeed, might be inferred to be the case, from the diminished supply of blood to the left ventricle in the one instance, and the retrogression of a portion of it in the other. In very great contraction of the aortic valves, the pulse is sometimes small, weak, and irregular; but in general it continues full, regular, and of due strength in this affection. Regurgitation at the aortic valves is attended with a peculiar jerking pulse; the stroke being at first quick and strong, but rapidly receding as it were from the fingers, in consequence no doubt of the backward movement of the blood at the origin of the aorta. Sometimes the pulse not only has the jerking character just mentioned, but, as stated by Dr. Corrigan, may be seen beating in various parts of the body. Dr. Williams considers this phenomenon, in its highest degree, and especially when it is observable in all states of the circulation, as characteristic of aortic regurgitation. Disease of the right valves has no direct effect upon the pulse.

Disease of the valves, when attended only with the symptoms above enumerated, may be considered serious, chiefly from the probable indication which it affords of approaching disease of the proper structure of the heart. In its advanced stages, if it advance at all, the symptoms become much more distressing, and conditions of system are gradually developed which sooner or later terminate in death. But, before it assumes this alarming character, hypertrophy, or dilatation, or both, have supervened, and the affection now ceases to be exclusively valvular. Cough, distressing dyspnœa, orthopnœa, hæmoptysis, apoplexy of the lungs, pneumonia, pulmonary œdema, dropsy of the pleura and pericardium, a pallid or livid complexion, purple lips, puffiness of the face, general anæmia, œdema of the extremities, passive hemorrhage from the alimentary mucous membrane, nausea and vomiting, bilious derangements, drowsiness or stupor, apoplexy, &c., are only a portion of the symptoms, which, in greater or less number and degree, attend this complicated disease of the heart.

Physical Signs.—These consist in the bellows murmur and its modifications, and the purring tremor. For a particular account of these, the reader is referred to the introductory remarks upon diseases of the heart. By means of the valvular murmurs, it is possible for an experienced ausculter to decide, with tolerable accuracy, in which of the valves the disease exists, and to a certain extent what is the nature of the disease, whether, for example, it consists in a constriction or insufficiency of the valves, whether it offers a direct impediment to the circulation, or permits regurgitation of the blood. The following are the rules, chiefly from Dr. Hope, by attention to which, according to that very high authority, an almost certain diagnosis may be made. It is proper, however, to observe that the want of murmurs is not a proof of the absence of all valvular disease, any more than their existence is a positive proof of its presence. Sometimes, in the advance of destructive cardiac disease, murmurs previously existing may cease. This has been observed especially in connection with contraction of the orifices. (*Stokes.*) It may depend on great muscular weakness of the heart.

1. *Aortic Valves.*—The murmur of contraction is heard during the ventricular systole, over the site of the valves, upon the sternum opposite the lower margin of the third rib, and thence two inches or more upwards towards the right of the sternum, along the course of the aorta, where it is louder than at any point below its place of origin. It may even sometimes be heard in the course of the descending aorta behind. The sound strikes the ear as superficial, and resembles the whispered letter *r*. It cannot proceed from the pulmonary valves, because not heard high up the pulmonary artery towards the left. It cannot be connected with the auriculo-ventricular valves, because the murmur of these, if heard at all in the situation referred to, will be very faint and remote, and in a lower key, like the whispered word *who.*

The aortic murmur of regurgitation accompanies the second sound, or the diastole of the heart, and is distinguished from the synchronous auriculo-ventricular murmurs by being louder over the aortic valves than near the apex of the heart, where the latter are heard most distinctly. It may be known not to be seated in the valves of the pulmonary artery by being heard more loudly up the course of the aorta, and down the left ventricle, than up the pulmonary artery, and down the right ventricle. From the murmur of aortic contraction it is distinguished by occurring during the period of the second sound, by being more audible down the ventricle, by its occasional prolongation through the period of repose, and even through an intermission of the ventricular contractions, and by its inferior loudness, greater softness, and lower key, resembling as it does the word *awe*, whispered in inspiration. The jerking character of the pulse of regurgitation must also be borne in mind; as well as, in some instances, the visible throbbing of the arteries over the body. Indeed, Dr. Corrigan, to whom much is due in the investigation of aortic insufficiency, gives visible pulsation of the arteries of the head and upper extremities as characteristic of this affection.* He mentions, as another sign, a bellows murmur in the ascending aorta, the carotids, and subclavians. (*Ed. Med. and Surg. Journ.*, April 1, 1832.) Sometimes the reflux of the blood stimulates the ventricle to a second contraction. (*Williams.*) According to Dr. P. Duroziez, of Paris, an intermittent double murmur in the crural artery, which has often been noticed as an occasional attendant on aortic insufficiency, is a constant sign of that lesion, though most frequently compression is necessary to its development. It is owing to the double movement of the blood, first forward under the heart's contraction and afterwards backward under that of the artery. By the aid of this double crural murmur, the cardiac murmur replacing the second sound, which characterizes the lesion, may be distinguished from similar murmurs from other causes, as from contraction of the mitral and tricuspid orifices, insufficiency of the pulmonary valves, and even lesions of the pericardium. The continuous murmur sometimes heard in the arteries is solely vascular, and is never heard as a result of insufficiency of the aortic valves. (*Arch. Gén.*, Mai, 1861, p. 605.)

Occasionally the aortic orifice is contracted, at the same time that the valves cannot accurately close, or that one of them is perforated; and the two sounds are both produced, the one being heard after the other, and giving rise to a proper sawing murmur.

Insufficiency of the aortic valves, with a regurgitant murmur, may occur without disease of the valves themselves, in consequence of an atheromatous and inelastic state of the sinuses of Valsalva, which, not duly contracting with the aorta, allow one or more of the valvular laminæ to be retroverted, so as to render accurate closure impossible. A case of this kind is recorded in *Guy's Hospital Reports* (A.D. 1859, p. 305). The same insufficiency may also result from an enlargement of the orifice to such an extent that the valves are not large enough to close it.

2. *Pulmonary Valves.*—The sounds of the pulmonary valves are the same as those of the aortic; but they are nearer the ear and of a higher key, approaching a whispered *s*. They are inaudible two inches up the aorta, but quite distinct the same distance up the pulmonary artery. The murmur of regurgitation is not attended with any peculiar jerking of the pulse, or visible throbbing of the arteries. The systolic murmur cannot be confounded with the synchronous auriculo-ventricular sound, because the latter is never heard up the pulmonary artery, or but very feebly. These murmurs of the pulmonary valves are very rare.

3. *Mitral Valves.*—The murmur of regurgitation is supposed to be heard during the systole, is often rough, and of a low key, like the whispered word *who*, and is louder near the apex of the heart, somewhat to the right of the

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* A case is recorded by Dr. J. H. Power, in which a pulsation was strikingly conspicuous on each side of the body in front, extending downward towards the groin, which, on examination, was found to be owing to a great enlargement of the internal mammary and epigastric arteries, which anastomosed. According to Dr. Power, this visible pulsation sometimes precedes the development of the regurgitant murmur, in the early stage of patency of the aortic valves. (*Dub. Quart. Journ.*, Nov. 1861, p. 819.)—*Note to the sixth edition.*

nipple, than over the cartilage of the fourth rib, near the sternum, beneath which it is seated, because, in the latter position, the intervening lung deadens the sound. Other reasons why this murmur is heard most distinctly near the apex of the heart, are, first, that the fleshy columns attached to the valves are inserted at this part, and thus serve as direct conductors of the sound, and, secondly, that the apex is in contact with the wall of the chest at the time that the murmur is formed. The regurgitant mitral murmur sometimes quite drowns the healthy first sound on the left side. Dr. Hope says that he has met with the purring tremor more frequently with this than with any other valvular lesion, especially when associated with a hypertrophied and dilated ventricle. According to the observations of Dr. Williams, a very large proportion of the cardiac murmurs, say five-sixths, in women and in the young below twenty, arise from mitral regurgitation; while in the older and in men, more depends upon disease of the aortic valves.

The murmur from contraction at the mitral valves is heard in the same positions as that of mitral regurgitation; but occurs during the diastole or second sound, and is comparatively very feeble and soft, in consequence of the slight force with which the blood enters the ventricle. The purring tremor never attends it.*

A mitral murmur, heard with an increase of the second sound in the right ventricle, or along the pulmonary artery, may be considered a pretty certain sign of organic disease of the mitral valves; as the effect of this is to produce impediment to the progress of the blood from the right side of the heart, which stimulates the right ventricle to increased effort, and thus increases the pulmonary semilunar sound. Skoda thinks that, without this increased intensity in the sound of the pulmonary valves, the mitral murmur cannot be considered as indicating defect of the mitral valves, but only roughness of their surfaces. (*Treat. on Auscult. and Percus.*, Lond. ed., 229 and 230.)

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* The views of the mitral sounds given in the text are retained, because probably still considered orthodox by the majority of the profession; but it appears to me that there are insurmountable obstacles to the admission of their entire accuracy. Thus, where, during life, mitral regurgitation has been indicated by the sounds, it has often happened after death that, instead of insufficiency of the valves, contraction of the orifice has been found, with the capacity of perfect closure. Besides, the murmur considered as systolic and regurgitant is heard most distinctly at the apex of the heart, which is contrary to the supposed direction of the blood; a fact, I think, very unsatisfactorily explained in the text. It ought to be loudest over the seat of the auriculo-ventricular valves where it is produced, or over the auricles, into which the current of regurgitant vibrating blood is directed. Now all difficulties are overcome by admitting the theory of diastolic impulse, as explained in former notes. According to this theory, the murmur heard in the active diastole along with the impulse, so far from being a regurgitant murmur, is one of contraction. It ought to be heard, as it is, most distinctly near the apex, because this is the direction of the current of blood which produces it. Dr. Hérard, of Paris, in a dissertation on the signs of derangement of the mitral orifice, asserts, as the result of observation, that the murmurs heard with the impulse at the apex are owing to the contraction of that orifice, and that insufficiency of the mitral valves, generally supposed to give rise to this murmur, is, in the vast majority of cases, incapable of determining the production of any murmur whatever. (*Archives Gén.*, Fév. 1854, p. 193) Dr. Markham states that the first sound, so far as his observation goes, is invariably associated with or superseded by a murmur, when the constriction of the orifice is considerable; that it is loudest at the apex, and that at the same place a distinct vibratory thrill is felt by the hand when the heart acts strongly. (*Dis. of the Heart*, p. 208–9.) Now it seems obvious to me, that this fact corresponds much better with the idea that a strong current is setting from the auricle towards the apex, than with that which refers the sound to a current in the exactly opposite direction. Dr. Gairdner maintains that the murmur, usually considered as regurgitant, is in almost every instance characteristic of mitral obstruction, of which it may be considered as an almost pathognomonic sign. He considers it as accompanying the auricular systole, as immediately preceding the first sound, and continuing up to the time of that sound. (*Med. T. & Gaz.*, Aug. 1864, p. 103, also March, 1865.) A moment's consideration would suffice to show, from how much embarrassment the admission of an active diastole would free the consideration of this subject; and, unless some other solution of the problem shall be found hereafter, it will have to end in the general acceptance of the diastolic impulse. If any regurgitant murmur is produced, it must, according to the diastolic theory, immediately follow the impulse, occur with the closing portion of the first normal sound, immediately precede the normal second sound, and accompany the semilunar murmur of contraction, when this murmur exists. (*Note to the fourth, fifth, and sixth editions.*)

The absence of the first sound, and of all murmurs in the place of it, may result from excess of the causes which tend to dull the sounds of the heart, and may not, therefore, indicate disease of the mitral valve; but, according to Skoda, if there be at the same time greater loudness of the sound of the pulmonary valves, or the second sound over the left ventricle be replaced by a murmur, there is reason to believe that the mitral valves are contracted, and probably also defective. (*Ibid.*, p. 231.)

4. *Tricuspid Valves.*—The morbid sounds of these valves are heard, like those of the mitral, a little above the apex of the heart; but are loudest more to the right, near or over the sternum. The pulse is not irregular, or but slightly so; and Dr. Hope states that he has never known the purring tremor attend them. Distension of the jugular veins, or a visible pulsation in these vessels, synchronous with a murmur replacing the first sound in the right ventricle, is pretty certain evidence of deficiency of the tricuspid valves. Without the murmur referred to, the venous pulsation might result from contraction of the right auricle alone. (*Skoda.*)

Sometimes the auriculo-ventricular, and the semilunar valves produce murmurs at the same time. In such instances, the characteristics of each are found in the same case, and the diagnosis may be made out with due attention and patience.

It is proper to state that very experienced ausculters consider the mere key of the murmur, to which Dr. Hope attached some importance, as not reliable in diagnosis, varying as it does with the varying force of the movement, and perhaps other not appreciable causes.

Diagnosis.—The most important diagnostic question for solution, in cases attended with the general symptoms and physical signs of valvular disease, is, whether they may not be the result of mere functional derangement. Most of the general symptoms may undoubtedly accompany anemic disease, without any lesion of the valves. We meet with them not unfrequently in dyspepsia. The bellows murmur is well known to be present in similar cases, and even the purring tremor is occasionally felt. It is important that in such cases, the decision should be correct; as it must influence the treatment. It will probably be sufficient to attend carefully to the following considerations. When the murmurs depend on organic disease, they are more constant; being in many cases heard under all circumstances of the circulation, whether the patient has been at rest or under excitement; and, when this is not the case, showing a certain degree of constancy under apparently similar circumstances, which is usually wanting in those of a merely nervous or functional character. The latter are often absent when the patient is at rest, and the heart calm, and though they may be temporarily excited by the stimulus of muscular exertion, are in the end benefited by moderate exercise, and often yield entirely to a tonic course of treatment. In nervous and anemic affections, the bellows murmur is free from roughness or harshness; in the organic it is often very rough, with various modifications, forming the *grating, rasping, sawing murmur*, &c. In the latter, the continuous venous murmur of the jugulars, so characteristic of anæmia, is wanting, unless this complaint be a complication of the valvular disease.

Dyspepsia is often accompanied with deranged action of the heart; but it is also a frequent result of disease of that organ, as are also those hepatic and gastric derangements usually called bilious symptoms. The physician should, therefore, be on his guard against mistaking real cardiac disease for mere dyspepsia, or disorder of the liver. Whenever, along with the latter affections, there is an irregular pulse, especially if the patient exhibit dyspnœa, or complain of pain or tightness in the præcordia, and of palpitation, though these are often nothing but nervous symptoms, the heart should be carefully examined by the stethoscope, so that any organic disease, if existing, may be detected.

Treatment.—It will be sufficient, in this place, to treat only of such therapeutic measures as have an immediate reference to the valvular disease. Those adapted to the complicated affections which have their origin in that disease, will be more conveniently considered under hypertrophy and dilatation, which are generally the immediate agents in their production.

Valvular disease is not necessarily fatal. Patients affected with it, in a greater or less degree, often live for many years, sometimes to old age, even though it may have begun early in life. In some instances, it appears to have no decided tendency to produce other organic changes in the heart; and its ordinary proneness to end in hypertrophy and dilatation may often be considerably controlled by treatment. Dr. Williams thinks that, while the ordinary sounds and impulses of the heart remain unimpaired, whatever abnormal sounds may be heard, and however loud, there is little ground for present alarm. It is when the healthy sounds are displaced by the abnormal, that most is to be apprehended, as the proper working of the heart is thus shown to be interfered with. A little excrescence, for example, may exist in a valvular opening, which may produce a murmur; but the regular action of the valve may not be impaired, the normal sound remains, though mixed with the abnormal, and no serious result ensues.

The remedial measures are, *first*, such as are calculated to correct the disease of the valves, and, *secondly*, such as may prevent its effects, so far as possible, by restraining the action of the heart. Unfortunately, our attempts to meet the first of these indications are often altogether vain. The disease has but too frequently advanced so far, before being recognized, as to be quite insusceptible even of amelioration by treatment; and it is sometimes, at the very commencement, of a nature which no remedies can control. Should it, however, have proceeded from inflammation, whether acute or chronic, there may be some hope of removing it, especially if attacked in its earlier stages. The means to be employed are such as will promote the absorption of the coagulable lymph already exuded, and prevent its further extravasation. Of these, the moderate and long-continued use of mercury is perhaps the most efficient. It should be pushed no further than to produce the slightest observable effect upon the gums, and may even stop short of this; but should be persevered in for months, if necessary, with occasional intermissions. Indeed, it may be proper, in some cases, to give it at intervals for years, where physical examination shows that it operates favourably, while at the same time there is a great tendency to a return of the symptoms. The mildest preparations should be preferred; and, upon the whole, the blue pill is probably the best. The preparations of iodine may also be employed, with the hope of advantage. Either the compound solution, or iodide of potassium may be used internally, and the ointment may be applied over the region of the heart. This remedy, also, to be effectual, must be long employed; and care must be taken that it do not disturb the stomach, or excite the circulation materially. As rheumatic or gouty disease may favour the deposition, any signs of these affections in or about the heart should be met as they occur by appropriate remedies, especially the wine of colchicum, with magnesia and a saline cathartic when laxatives may seem to be called for. Occasional cupping or leeching in the precordial region, or between the shoulders, and repeated blistering or pustulation by tartar emetic over the heart, may prove useful under similar circumstances, or whenever the disease is attended with pain or much uneasiness. In gouty cases, or whenever, from calculous deposition elsewhere, there may be any reason to apprehend similar deposition about the valves, the free use of bicarbonate of soda or of potassa is indicated. Half a drachm of it may be given with carbonic acid water twice or three times a day, and continued for a long time.

But, as disease of the valves often originates in degenerations of tissue, dependent upon a depraved or insufficient nutrition, it is important to attend to the state of system, and if found anemic or otherwise debilitated, to correct it by chalybeates, tonics, nutritious food, and other measures calculated to invigorate the nutritive function, and to improve the blood.

As the greatest danger from diseased valves is the production of hypertrophy or dilatation, attention should be especially directed to the prevention of these affections, or, if their prevention be impracticable, to the rendering of their progress as slow as possible. For this purpose, it is necessary to restrain the action of the heart, and, as far as may be, obviate congestion in its cavities. The remedies to be used must vary with the state of the system. If the patient is plethoric, with a florid face and a full strong pulse, blood may be taken occasionally from the arm in moderate quantities; but the practitioner must be on his guard not to push this remedy to the point of producing anæmia, which is even a more powerful stimulant to the heart than plethora. An occasional dose of sulphate of magnesia will be an excellent adjuvant to the lancet, or a substitute for it when the plethora may hardly be sufficient to justify its use. In cases already anemic, with paleness of face, lips, and tongue, though the pulse may be frequent and voluminous, bleeding should be avoided; and it may even be advisable to employ chalybeates, and the milder vegetable bitters. In cases not of great debility, digitalis, or hydrocyanic acid may be used in order to lessen the frequency of the pulse when excited. A very ingenious discrimination is made by Dr. Corrigan in the use of digitalis in valvular disease. When the aortic valves are diseased, the excessive action of the heart is compensatory, being required for the supply of the system, from which the normal amount of blood would otherwise be withheld. In such cases, digitalis can do only harm, by repressing the heart's action, unless in excess of the systemic demand. But in mitral disease it is otherwise. Here it is desirable rather to repress the action of the ventricle, and thus allow the blood to flow into it, so as to fill it as much as possible, and thereby secure a larger supply for the aorta, and of course for the system. (*Med. T. & Gaz.*, Dec. 1862, p. 669.) Should the heart beat frequently in consequence of disorder of the nervous system, narcotics and nervous stimulants will sometimes be useful, reference being had, in the selection of the article, to the general strength. Thus, hyoscyamus and conium are preferable in sthenic cases, opiates, with camphor-water, Hoffmann's anodyne, aromatic spirit of ammonia, valerian, or assafetida, in debility. Wild-cherry bark is admirably adapted to cases of this kind, in which tonics may be indicated. I am much in the habit of using it in connection with the tincture of digitalis. The state of the stomach should be carefully attended to, as any disorder of this organ is very apt to excite the heart. Hence, antacids, laxatives, and all the remedies applicable to dyspepsia are sometimes called for.

Attention to the diet is highly important. This must be regulated, of course, by the state of the system. As a general rule, it should be such as sufficiently to support nutrition, without stimulating. When there is decided plethora with vascular excitement, it should consist of vegetable food exclusively; in ordinary cases, with a tendency to plethora, milk may be added to the vegetables; and, when there is no such tendency, the more nutritious kinds of animal food may be allowed; but, unless in positive debility or anæmia, meats should be sparingly used, and should generally be preferred boiled, because less stimulating in this state. If the patient find that milk and the farinaceous substances, with vegetables and fruits, are sufficient to support his strength, it would generally be best that he should restrict himself to them exclusively.

Exercise is important, in order to sustain a due condition of the digestive and nutritive functions, and prevent an irritable state of the nervous system. Absolute rest, though well adapted to acute cardiac diseases, becomes highly injurious in chronic cases, by impairing the general health, and increasing the excitability of the heart. Yet active exercise is even more injurious, by directly stimulating the circulation. Hence, the patient should never run, nor walk very rapidly, nor ascend heights, nor use violent muscular exertion of any kind. It is necessary that he should keep a constant watchfulness over his movements in these respects. One hasty ascent of an abrupt or considerable elevation may undo the effects of months of caution. Passive exercise, on horseback or in a carriage, is usually preferable to walking; and, in selecting the horse, one of easy gait, and requiring little muscular effort to control him, should be preferred.

Tranquillity of mind is essential in these cases; and the vigilance of the patient is more especially requisite in its preservation, as disease of the heart is very apt to be attended with an irritable or excitable temper. There is no lesson which it is more important to inculcate upon an individual affected with valvular disease of this organ, than to school himself early into a control over his emotions, and, when this is unattainable, to avoid with the greatest care every occasion of disturbance to his equanimity.

Article V.

HYPERTROPHY AND DILATATION.

The dimensions of the heart may be increased either by augmentation of its muscular tissue, or enlargement of its cavities. To the former of these changes, when the result of an overgrowth of the organ, without appreciable degeneration of its substance, the name of hypertrophy has been given; to the latter, that of dilatation. As they are most frequently associated together, often dependent on the same cause, and in many respects productive of the same symptoms, they will be most conveniently treated of under one general head; all that is common to them in their several distinct relations being first considered, and afterwards what is peculiar to each. They were at one time confounded under the common name of *aneurism of the heart*, applied to them by Baillou and Lancisi. Corvisart made a great advance by distinguishing two forms of cardiac expansion, one with increased thickness, the other with attenuation of the muscular parietes. The former he called *active*, the latter *passive aneurism*. But it was not till the publication of the memoirs of M. Bertin, in 1811, that the subject was fully understood. It was he who first clearly pointed out the occasional distinct existence of hypertrophy and dilatation, and gave that precision to the knowledge of their different forms and associations which is now possessed by the profession. The five following forms are at present recognized, viz.; 1. *simple hypertrophy*, in which the walls of the heart are thickened, without any change in the size of its cavities; 2. *hypertrophy with contraction*, in which, along with increased thickness of the walls, there is a diminution of one or more of the cavities; 3. *hypertrophy with dilatation*, in which the walls are increased and the cavities enlarged; 4. *simple dilatation*, in which there is increase of the bulk of the heart, with attenuation of its parietes; and, 5. *partial dilatation*, or *proper aneurism of* *the heart*, in which a portion only of the walls of one of the cavities is expanded, forming an aneurismal sac upon the surface.

In order to decide, in all cases, upon the existence of either hypertrophy or dilatation, it is necessary that we should be acquainted with the dimensions of the heart in health. Unfortunately, these cannot be determined with accuracy. The heart varies in size with the period of life, not only growing with the growth of the body, but, according to the best authorities, continuing to enlarge after maturity, even to old age, at least so far as regards the left ventricle. It is considerably larger in males than females, and differs, in the same sex, according to the size of the body, especially the breadth of the chest or shoulders, to the relative proportion of the sanguiferous system, and, in some degree, to the more or less vigorous habits of the individual; and all within the limits of perfect health. These circumstances, therefore, must be taken into consideration in determining how far any supposed enlargement of the heart is morbid; and, even in the case of a considerable deviation from the average standard of health, we should hesitate to pronounce it the result of disease, if no morbid phenomena had been presented during life.

Laennec roughly estimates the size of the healthy heart to be about that of the fist of the individual. Elaborate measurements have been made by M. Bouillaud, Dr. Clendinning, and M. Bizot, for an account of which the reader is referred to Dr. Pennock's edition of Hope's work upon Diseases of the Heart. According to Dr. Clendinning, the average weight of the adult heart is in the male about 9 ounces, in the female 8 ounces, or somewhat more. M. Bouillaud makes the mean circumference at the base 8 or 9 inches; the transverse and longitudinal diameters about 3·5 inches, the former being generally somewhat greater; the antero-posterior diameter about 2 inches; the thickness of the left ventricle at the base from 6 to 7 lines; that of the right ventricle at the base 2·5 lines, of the left auricle 1·5 lines, and of the right auricle 1 line. The ventricular walls are thickest near the base, and gradually diminish towards the apex. The left is somewhat more than twice as thick in the adult as the right; but the disproportion is less in the fœtus and young infant, and gradually increases during life. The left ventricle does not collapse when opened, the right collapses. The four cavities are about equal, but, the walls of the auricles being much thinner, these seem to constitute together only about one-third of the heart. Bouillaud states that the ventricular cavities will, on an average, contain a hen's egg, though the right is somewhat larger. From the tables of M. Bizot, it may be inferred that the several measurements of the heart, as to length, breadth, and thickness of the walls, are in children from 1 to 4 years old somewhere about one-half, from 5 to 9 about two-thirds, and from 10 to 15 about three-quarters those of the adult above 50.*

Anatomical Characters.

The enlargement, whether of hypertrophy, dilatation, or the two combined, may affect the whole heart, or only one or more of its cavities, leaving the others sound; and the latter event is much more common than the former. In some instances, one cavity is affected in one manner, and another in another; and it not unfrequently happens that, when two or more are affected by the same disease, they are so in different degrees.

Hypertrophy with or without Dilatation.—The ventricles are more frequently hypertrophied than the auricles, and the left ventricle and auricle more frequently than the right. The whole heart is rarely affected, but the two ventricles not unfrequently. The auricles are seldom thickened independently of the ventricles; and, when they become so, it is the appendix that is chiefly affected. The fleshy columns, the partitions between the cavities, and even the valves, may also be thickened, either independently, or in connection with the walls. The right cavity has been known to be nearly filled with the overgrown columnæ carneæ. The hypertrophy may even be confined to a portion of one of the ventricular walls.

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* For an elaborate paper on the weight and dimensions of the heart, in health and disease, by Dr. Thos. B. Peacock, in which results obtained by himself are compared with those of others, as Bouilliaud, Bizot, Reid, Ranking, &c., see the *Edinburgh Monthly Journal of Medical Science* for Sept., Oct., and Nov., 1854.

According to Cruveilhier, hypertrophy cannot be said to exist unless the heart weigh 10 or 12 ounces, and, in relation to the ventricles, unless the left have a thickness of 7 or 8 lines, and the right of 4 or 5. Reference is had to the adult male. But, according to Bizot, a thickness of 3 lines would indicate hypertrophy of the right ventricle, which, upon the same authority, is in health only 2·1 lines thick in its thickest part, in men between the fiftieth and seventy-ninth year, and 1·25 lines at the same age in women. Though the thickness of the ventricles is usually greatest near the base, and gradually diminishes towards the apex, yet sometimes it is nearly equal throughout, sometimes greatest either in the middle or at the point. In the left ventricle, it is said to have reached 2 inches, though it does not often exceed 1·25 inches or 15 lines. The right ventricle is rarely more than 5 or 6 lines thick, but has been known to be as much as 15 or more. It does not collapse, when cut into, as in the healthy state.

The substance of the muscle is often changed in consistence and colour, being usually firmer and redder than in health. It is not, however, always thus; but, in cases of a cachectic, anemic, or otherwise debilitated condition of system, sometimes participates in the paleness and flabbiness that characterize the muscular tissue in general. In some instances, too, it is found, when examined by the microscope, to have undergone fatty degeneration. Complications of pericardial adhesion, and of various alterations of the valves and lining membrane of the cavities, evincing previous inflammation, are not unfrequently found upon dissection.

Simple Hypertrophy.—This is not frequent, as the capacity of the cavities is generally altered in one way or the other. The affection is confined to the ventricles; the auricles, when hypertrophied, being almost invariably dilated also. The bulk of the heart is somewhat increased, but not very greatly so.

Hypertrophy with Contraction.—*Concentric Hypertrophy.* (Bertin.)—In this variety, the heart is not necessarily augmented in bulk. The walls are sometimes very thick, and the cavity exceedingly contracted, occasionally to the size of a pigeon's egg, or even the shell of an almond. Doubts, however, have been entertained as to the morbid character of this diminution of capacity. Cruveilhier has suggested that it might be owing to vigorous contraction at the time of death, or immediately afterwards. In support of this opinion, the facts are adduced, that a similar diminution has been observed in criminals after execution, and that the contracted cavity has been dilated by the finger. But, though the explanation may apply to some cases, it cannot be considered as applicable to all; for the contraction has been often observed in cases of lingering death, and, even admitting that the cavity may be dilated by the finger in all instances, which has certainly not been proved, still this may be owing to a mechanical expansibility of the tissue, and not to the relaxation of a muscular spasm.

Hypertrophy with Dilatation.—*Active Aneurism of the Heart.* (Corvisart.)—*Eccentric Hypertrophy.* (Bertin.)—This is by far the most frequent variety of cardiac enlargement, and is a very frequent affection. Out of 380 cases of post-mortem examination, hypertrophy was found by Dr. Van der Byl in 70, of which 46 were in males and 24 in females. The mitral valves out having suffered dilatation. The former condition may be distinguished from the latter by the disposition evinced to return to the ordinary size when emptied, whereas the dilated walls do not contract under similar circumstances.

Pure dilatation, unmixed with hypertrophy, is comparatively rare; but, for practical purposes, all those cases in which the peculiar phenomena of dilatation predominate may, with propriety, be ranked under this head.

The muscular fibre in this affection is usually pale, softened, and flaccid, sometimes, however, purplish or violet, as if congested in common with most of the other great organs. It is sometimes affected with fatty degeneration. The heart collapses when empty. In some instances, the distension has been so great as to produce a rupture of the walls, and effusion of blood into the pericardium.

Partial Dilatation.—Aneurism of the Heart.—The term aneurism applied to ordinary enlargement of the heart is not correct, as there is no analogy between that affection and the disease of the arteries to which the name properly belongs. Such an analogy, however, is strikingly exhibited by the partial dilatation now under consideration, which has, therefore, very properly been named aneurism of the heart by recent writers. To Mr. Thurnham the profession is indebted for the precision which has been introduced into the pathology of this affection. It consists of a pouch, produced by the dilatation of a portion of the walls of one of the cavities, and usually forms a tumour on the surface of the heart, though sometimes scarcely projecting, being formed in the wall itself by the expansion of the inner membrane, and the absorption of the muscular tissue before it. Generally only one pouch exists, but instances have been recorded in which there were two or more. They vary greatly in size, from the smallest dimensions up to those of an orange, or of the heart itself. Sometimes all the constituents of the walls are distended, including the muscular tissue; sometimes this is wanting, and the sac consists of the outer and inner membranes; and again the endocardium is ruptured or ulcerated, and the parts exterior to it dilated. In some instances, adhesions have been formed with the loose portion of the pericardium; in others, the tumour has opened into the cavity formed by that membrane. The sac often contains laminated coagula of blood, especially when its mouth is narrow. The tissues of the heart are found variously degenerated; either the endocardium, or muscular layer, or both, exhibiting organic changes. An instance in which a complete spontaneous cure of a proper aneurism of the heart appears to have taken place is recorded in the *Lond. Med. Times and Gaz.* (Nov. 1856, p. 479).

Symptoms.

It will best conduce to an accurate understanding of the subject, to detail first the general symptoms common to the affections above mentioned, and afterward, so far as they can be distinguished, those peculiar to each.

The disease usually makes its advances very slowly. In the beginning, the patient complains only of occasional palpitations, dyspnœa, and perhaps slight precordial pain, stricture or other uneasiness, induced by some unwonted muscular exertion, mental excitement, or excess in eating or drinking, and sometimes without any obvious cause, especially at night. He finds himself unable to run, or mount hills, or ascend flights of stairs, with the same facility as before, and is more readily fatigued by ordinary exercise. These symptoms, however, are at first seldom sufficient to excite alarm. It is a fact noticed by Dr. Hope, that, though at the commencement of active movement the patient may experience some of the inconveniences alluded to, he often loses them by a continuance of the exertion, in consequence probably of the blood being more strongly diverted to the surface. The disease may remain long in this state, sometimes, indeed, to extreme old age, if great care is taken to regulate the habits of body and mind; but it often gradually increases; slighter causes induce the peculiar symptoms; and the palpitations and dyspnœa at length become habitual, being either induced by the least excitement, or never entirely absent, though still liable to remissions and exacerbations. The throbbing of the heart is almost always sensible to the hand applied to the præcordia, and often visible to the eye; and occasionally it is so violent as obviously to agitate not only the chest but the whole frame. Acute pains, like those of angina pectoris, shoot in some instances through the chest, and into the left arm; and, when these are wanting, the patient often complains of dull pain, oppression, tightness, weight, or other uneasiness about the præcordia or epigastrium.

The pulse is very differently affected, being sometimes full and strong, sometimes soft, small, and feeble, generally regular and little increased in frequency in the early stages, except during paroxysms of palpitation, but at an advanced period often becoming intermittent and irregular, and always so in cases in which certain kinds of valvular disease are connected with that of the muscular tissue.

Along with these symptoms, which proceed immediately from the heart, the patient experiences many others resulting from various secondary affections. The head generally suffers more or less, either from excess or deficiency of arterial blood, or from venous congestion. Hence, headache, vertigo, ringing in the ears, flushed or pallid face, swollen features, prominent and watery eyes, frequent attacks of epistaxis, and, in the advanced stages, not unfrequently faintness or partial syncope, mental hebetude, drowsiness, stupor, coma, and finally apoplectic effusion.

The lungs are almost always sooner or later involved. The blood is driven into them too forcibly, or, escaping with difficulty through the pulmonary veins, becomes congested in their vessels. The proper function of the lungs is thus impeded; effusion of serum or sero-mucous fluid, or of blood, takes place into the bronchia and air-cells; serous liquid is often poured out into the areolar tissue of the lungs or into the pleural cavities, and bronchitis, pneumonia, or pulmonary apoplexy, may be added to the already formidable list. Dyspnœa, cough, expectoration more or less copious and difficult, hæmoptysis active or passive, disturbed sleep, sudden startings at night, horrible dreams, great uneasiness in the horizontal position, and occasionally complete orthopnœa, are the consequent symptoms. Indeed, many cases, such as were formerly considered as asthma, are nothing more than chronic dyspnœa, dependent on disease of the heart. It is not difficult to understand the source of this disorder of respiration. The augmented size of the heart, the sanguineous congestion of the lungs, the collection of fluid in the air-cells, bronchial tubes, and intervesicular tissue, the consolidation from pneumonia, and the pressure from pleuritic effusion, all may contribute their part, some in one case and some in another, in preventing the proper access of air to the blood; while, from the mechanical obstacle opposed by the cardiac disease, the blood itself is detained in the lungs, and often cannot pass on in due quantity to fulfil its office in all parts of the system. From the lungs, therefore, from the heart itself, and from all parts of the body, goes up by the afferent nerves an impression to the nervous centres, which excites in these the painful sense of want of breath, and leads to violent reflex actions in the respiratory organs, for the purpose of supplying the deficiency. These severe respiratory symptoms occur more or less paroxysmally, being brought on by accidental influences disturbing the cardiac functions, and not unfrequently without appreciable cause.

But the organs mentioned are not the only ones affected. Congestion of the liver, stomach, bowels, and kidneys, either active or passive, but especially the latter, gives rise to numerous symptoms indicative of derangement in these viscera. Hence dyspeptic sensations in the epigastrium, irregular appetite, nausea and vomiting, constipation or diarrhœa, obvious enlargement of the liver, jaundice, disordered alvine evacuations, melæna, albuminous urine, and hemorrhage, usually of the passive kind, from the stomach, bowels, and urinary passages. It is not pretended that all these phenomena are present in every case; but every one of them, and many others of a similar origin, make their appearance occasionally in one or another case of heart disease. It has, indeed, been ascertained by Dr. Clendinning, as the result of dissection, that hypertrophy of the viscera mentioned is very apt to ensue, in consequence of the sanguineous congestion to which they are exposed.

At length a universal disposition to dropsical effusion is developed. The venous system everywhere loaded, or the arterial capillaries everywhere distended, relieve themselves by the extravasation of the serous portion of the blood. Edematous swelling, first showing itself as a general rule in the feet, gradually extends upwards, until it involves at length the whole body, including not only the areolar tissue, but often the serous cavities also. The urine becomes scanty and high coloured, and the skin dry, as in dropsy from other causes. The distress from shortness of breath now becomes extreme; the paroxysms of cough and dyspnœa increase in violence; the patient, unable to lie down in bed, often sits day and night, with his body bending forward, and his head supported, harassed by want of rest, and the dread of impending suffocation; the chest heaves with the forced inspirations, and the body shakes under the tremendous impulses of the heart. The appetite fails, the pulse sinks, the skin becomes cool, and the lips and extremities assume a purple or livid hue. Finally, one of the great vital organs, the brain, the lungs, or the heart, sinks under the overwhelming burden; and death, often preceded by stupor or delirium, closes the long series of suffering.

Happily, it is not always that the patient is exposed to these protracted and most painful struggles. Death not unfrequently surprises him at a comparatively early period, and before he has yet suffered greatly. Sudden death is, indeed, one of the characteristics of heart affections. The patient, perhaps wholly unconscious of the nature of his complaint, supposing himself to be affected with asthma, or chronic catarrh, or dropsy in the chest, or possibly only with weakness, is suddenly seized, while walking in the street, or resting in his chair, or in his bed at night, with a sense of faintness, which soon becomes perfect insensibility, and life is often extinct before relief can be obtained. Such a result sometimes proceeds from a rupture of the heart; but more frequently it is only a prolonged intermission, if we may so express ourselves, of the heart's pulsation. It is a continued syncope. Apoplexy is another mode which nature has kindly provided for escape from protracted suffering. It frequently happens, moreover, that some intercurrent inflammatory disease, which might prove harmless if occurring in health, is rendered fatal by the cardiac complication.

In the last stages of the dropsical affection, the distended skin of the lower extremities sometimes gives way, either by rupture, ulceration, or inflammation followed by sloughing; and considerable relief is obtained from the more violent symptoms by the escape of serum through the openings. In such instances, however, death almost always follows in a short time, though in a mitigated form, from the exhaustion of the discharge, and of the irritative fever. Sometimes gangrene of the lower extremities takes place, independently of the mere effusion, being the direct result of the impeded circulation.

In the more complicated cases above described, the muscular affection of the heart is very often associated with disease of the valves, and it is by the united influence of the two forms of derangement that the symptoms are produced. It is, in fact, in this way, that organic valvular disease, when it is to end fatally, generally terminates.

duce impediment to the progress of the blood from the right side of the heart, which stimulates the right ventricle to increased effort, and thus increases the pulmonary semilunar sound. Skoda thinks that, without this increased intensity in the sound of the pulmonary valves, the mitral murmur cannot be considered as indicating defect of the mitral valves, but only roughness of their surfaces. (*Treat. on Auscult. and Percus.*, Lond. ed., 229 and 230.)

The absence of the first sound, and of all murmurs in the place of it, may result from excess of the causes which tend to dull the sounds of the heart, and may not, therefore, indicate disease of the mitral valve; but, according to Skoda, if there be at the same time greater loudness of the sound of the pulmonary valves, or the second sound over the left ventricle be replaced by a murmur, there is reason to believe that the mitral valves are contracted, and probably also defective. (*Ibid.*, p. 231.)

4. *Tricuspid Valves.*—The morbid sounds of these valves are heard, like those of the mitral, a little above the apex of the heart; but are loudest more to the right, near or over the sternum. The pulse is not irregular, or but slightly so; and Dr. Hope states that he has never known the purring tremor attend them. Distension of the jugular veins, or a visible pulsation in these vessels, synchronous with a murmur replacing the first sound in the right ventricle, is pretty certain evidence of deficiency of the tricuspid valves. Without the murmur referred to, the venous pulsation might result from contraction of the right auricle alone. (*Skoda.*)

Sometimes the auriculo-ventricular, and the semilunar valves produce murmurs at the same time. In such instances, the characteristics of each are found in the same case, and the diagnosis may be made out with due attention and patience.

It is proper to state that very experienced auscultors consider the mere key of the murmur, to which Dr. Hope attached some importance, as not reliable in diagnosis, varying as it does with the varying force of the movement, and perhaps other not appreciable causes.

Diagnosis.—The most important diagnostic question for solution, in cases attended with the general symptoms and physical signs of valvular disease, is, whether they may not be the result of mere functional derangement. Most of the general symptoms may undoubtedly accompany anemic disease, without any lesion of the valves. We meet with them not unfrequently in dyspepsia. The bellows murmur is well known to be present in similar cases, and even the purring tremor is occasionally felt. It is important that in such cases, the decision should be correct; as it must influence the treatment. It will probably be sufficient to attend carefully to the following considerations. When the murmurs depend on organic disease, they are more constant; being in many cases heard under all circumstances of the circulation, whether the patient has been at rest or under excitement; and, when this is not the case, showing a certain degree of constancy under apparently similar circumstances, which is usually wanting in those of a merely nervous or functional character. The latter are often absent when the patient is at rest, and the heart calm, and though they may be temporarily excited by the stimulus of muscular exertion, are in the end benefited by moderate exercise, and often yield entirely to a tonic course of treatment. In nervous and anemic affections, the bellows murmur is free from roughness or harshness; in the organic it is often very rough, with various modifications, forming the *grating, rasping, sawing murmur*, &c. In the latter, the continuous venous murmur of the jugulars, so characteristic of anæmia, is wanting, unless this complaint be a complication of the valvular disease.

Dyspepsia is often accompanied with deranged action of the heart; but it is also a frequent result of disease of that organ, as are also those hepatic and gastric derangements usually called bilious symptoms. The physician should, therefore, be on his guard against mistaking real cardiac disease for mere dyspepsia, or disorder of the liver. Whenever, along with the latter affections, there is an irregular pulse, especially if the patient exhibit dyspnœa, or complain of pain or tightness in the præcordia, and of palpitation, though these are often nothing but nervous symptoms, the heart should be carefully examined by the stethoscope, so that any organic disease, if existing, may be detected.

Treatment.—It will be sufficient, in this place, to treat only of such therapeutic measures as have an immediate reference to the valvular disease. Those adapted to the complicated affections which have their origin in that disease, will be more conveniently considered under hypertrophy and dilatation, which are generally the immediate agents in their production.

Valvular disease is not necessarily fatal. Patients affected with it, in a greater or less degree, often live for many years, sometimes to old age, even though it may have begun early in life. In some instances, it appears to have no decided tendency to produce other organic changes in the heart; and its ordinary proneness to end in hypertrophy and dilatation may often be considerably controlled by treatment. Dr. Williams thinks that, while the ordinary sounds and impulses of the heart remain unimpaired, whatever abnormal sounds may be heard, and however loud, there is little ground for present alarm. It is when the healthy sounds are displaced by the abnormal, that most is to be apprehended, as the proper working of the heart is thus shown to be interfered with. A little excrescence, for example, may exist in a valvular opening, which may produce a murmur; but the regular action of the valve may not be impaired, the normal sound remains, though mixed with the abnormal, and no serious result ensues.

The remedial measures are, *first*, such as are calculated to correct the disease of the valves, and, *secondly*, such as may prevent its effects, so far as possible, by restraining the action of the heart. Unfortunately, our attempts to meet the first of these indications are often altogether vain. The disease has but too frequently advanced so far, before being recognized, as to be quite insusceptible even of amelioration by treatment; and it is sometimes, at the very commencement, of a nature which no remedies can control. Should it, however, have proceeded from inflammation, whether acute or chronic, there may be some hope of removing it, especially if attacked in its earlier stages. The means to be employed are such as will promote the absorption of the coagulable lymph already exuded, and prevent its further extravasation. Of these, the moderate and long-continued use of mercury is perhaps the most efficient. It should be pushed no further than to produce the slightest observable effect upon the gums, and may even stop short of this; but should be persevered in for months, if necessary, with occasional intermissions. Indeed, it may be proper, in some cases, to give it at intervals for years, where physical examination shows that it operates favourably, while at the same time there is a great tendency to a return of the symptoms. The mildest preparations should be preferred; and, upon the whole, the blue pill is probably the best. The preparations of iodine may also be employed, with the hope of advantage. Either the compound solution, or iodide of potassium may be used internally, and the ointment may be applied over the region of the heart. This remedy, also, to be effectual, must be long employed; and care must be taken that it do not disturb the stomach, or excite the circulation materially. As rheumatic or gouty disease may favour the deposition, any signs of these affections in or about the heart should be met as they occur by appropriate remedies, especially the wine of colchicum, with magnesia and a saline cathartic when laxatives may seem to be called for. Occasional cupping or leeching in the præcordial region, or between the shoulders, and repeated blistering or pustulation by tartar emetic over the heart, may prove useful under similar circumstances, or whenever the disease is attended with pain or much uneasiness. In gouty cases, or whenever, from calculous deposition elsewhere, there may be any reason to apprehend similar deposition about the valves, the free use of bicarbonate of soda or of potassa is indicated. Half a drachm of it may be given with carbonic acid water twice or three times a day, and continued for a long time.

But, as disease of the valves often originates in degenerations of tissue, dependent upon a depraved or insufficient nutrition, it is important to attend to the state of system, and if found anemic or otherwise debilitated, to correct it by chalybeates, tonics, nutritious food, and other measures calculated to invigorate the nutritive function, and to improve the blood.

As the greatest danger from diseased valves is the production of hypertrophy or dilatation, attention should be especially directed to the prevention of these affections, or, if their prevention be impracticable, to the rendering of their progress as slow as possible. For this purpose, it is necessary to restrain the action of the heart, and, as far as may be, obviate congestion in its cavities. The remedies to be used must vary with the state of the system. If the patient is plethoric, with a florid face and a full strong pulse, blood may be taken occasionally from the arm in moderate quantities; but the practitioner must be on his guard not to push this remedy to the point of producing anæmia, which is even a more powerful stimulant to the heart than plethora. An occasional dose of sulphate of magnesia will be an excellent adjuvant to the lancet, or a substitute for it when the plethora may hardly be sufficient to justify its use. In cases already anemic, with paleness of face, lips, and tongue, though the pulse may be frequent and voluminous, bleeding should be avoided; and it may even be advisable to employ chalybeates, and the milder vegetable bitters. In cases not of great debility, digitalis, or hydrocyanic acid may be used in order to lessen the frequency of the pulse when excited. A very ingenious discrimination is made by Dr. Corrigan in the use of digitalis in valvular disease. When the aortic valves are diseased, the excessive action of the heart is compensatory, being required for the supply of the system, from which the normal amount of blood would otherwise be withheld. In such cases, digitalis can do only harm, by repressing the heart's action, unless in excess of the systemic demand. But in mitral disease it is otherwise. Here it is desirable rather to repress the action of the ventricle, and thus allow the blood to flow into it, so as to fill it as much as possible, and thereby secure a larger supply for the aorta, and of course for the system. (*Med. T. & Gaz.*, Dec. 1862, p. 669.) Should the heart beat frequently in consequence of disorder of the nervous system, narcotics and nervous stimulants will sometimes be useful, reference being had, in the selection of the article, to the general strength. Thus, hyoscyamus and conium are preferable in sthenic cases, opiates, with camphor-water, Hoffmann's anodyne, aromatic spirit of ammonia, valerian, or assafetida, in debility. Wild-cherry bark is admirably adapted to cases of this kind, in which tonics may be indicated. I am much in the habit of using it in connection with the tincture of digitalis. The state of the stomach should be carefully attended to, as any disorder of this organ is very apt to excite the heart. Hence, antacids, laxatives, and all the remedies applicable to dyspepsia are sometimes called for.

Attention to the diet is highly important. This must be regulated, of course, by the state of the system. As a general rule, it should be such as sufficiently to support nutrition, without stimulating. When there is decided plethora with vascular excitement, it should consist of vegetable food exclusively; in ordinary cases, with a tendency to plethora, milk may be added to the vegetables; and, when there is no such tendency, the more nutritious kinds of animal food may be allowed; but, unless in positive debility or anæmia, meats should be sparingly used, and should generally be preferred boiled, because less stimulating in this state. If the patient find that milk and the farinaceous substances, with vegetables and fruits, are sufficient to support his strength, it would generally be best that he should restrict himself to them exclusively.

Exercise is important, in order to sustain a due condition of the digestive and nutritive functions, and prevent an irritable state of the nervous system. Absolute rest, though well adapted to acute cardiac diseases, becomes highly injurious in chronic cases, by impairing the general health, and increasing the excitability of the heart. Yet active exercise is even more injurious, by directly stimulating the circulation. Hence, the patient should never run, nor walk very rapidly, nor ascend heights, nor use violent muscular exertion of any kind. It is necessary that he should keep a constant watchfulness over his movements in these respects. One hasty ascent of an abrupt or considerable elevation may undo the effects of months of caution. Passive exercise, on horseback or in a carriage, is usually preferable to walking; and, in selecting the horse, one of easy gait, and requiring little muscular effort to control him, should be preferred.

Tranquillity of mind is essential in these cases; and the vigilance of the patient is more especially requisite in its preservation, as disease of the heart is very apt to be attended with an irritable or excitable temper. There is no lesson which it is more important to inculcate upon an individual affected with valvular disease of this organ, than to school himself early into a control over his emotions, and, when this is unattainable, to avoid with the greatest care every occasion of disturbance to his equanimity.

Article V.

HYPERTROPHY AND DILATATION.

THE dimensions of the heart may be increased either by augmentation of its muscular tissue, or enlargement of its cavities. To the former of these changes, when the result of an overgrowth of the organ, without appreciable degeneration of its substance, the name of hypertrophy has been given; to the latter, that of dilatation. As they are most frequently associated together, often dependent on the same cause, and in many respects productive of the same symptoms, they will be most conveniently treated of under one general head; all that is common to them in their several distinct relations being first considered, and afterwards what is peculiar to each. They were at one time confounded under the common name of *aneurism of the heart*, applied to them by Baillou and Lancisi. Corvisart made a great advance by distinguishing two forms of cardiac expansion, one with increased thickness, the other with attenuation of the muscular parietes. The former he called *active*, the latter *passive aneurism*. But it was not till the publication of the memoirs of M. Bertin, in 1811, that the subject was fully understood. It was he who first clearly pointed out the occasional distinct existence of hypertrophy and dilatation, and gave that precision to the knowledge of their different forms and associations which is now possessed by the profession. The five following forms are at present recognized, viz.; 1. *simple hypertrophy*, in which the walls of the heart are thickened, without any change in the size of its cavities; 2. *hypertrophy with contraction*, in which, along with increased thickness of the walls, there is a diminution of one or more of the cavities; 3. *hypertrophy with dilatation*, in which the walls are increased and the cavities enlarged; 4. *simple dilatation*, in which there is increase of the bulk of the heart, with attenuation of its parietes; and, 5. *partial dilatation*, or *proper aneurism of* were diseased in 32 and the aortic in 36; and in 22 of these, mitral and aortic disease coexisted. (*Ranking's Abstract*, xxvii. 86.) The disease may exist in two forms, in one with, in the other without thickening of the walls. As the cavities are distended, it is obvious that, in the latter as well as in the former case, there must be increase of the muscular tissue, and consequently hypertrophy, unless the parietes are absolutely attenuated. Indeed, some attenuation might exist, and the quantity of muscle still be greater than in health.

The degree of enlargement varies from the slightest excess above the measure of health, to twice, thrice, or even four times the ordinary volume. A case is on record, in which the weight of the organ was 5 pounds, and another in which the length was more than 9 inches, and the circumference at the base 15·5 inches. (*Dict. de Méd.*, viii. 287.) Dr. Clendinning found the average weight, in eighty hypertrophied hearts which he examined, to be 15 ounces, not quite double that of the healthy heart. The greatest weight found by him was 40 ounces 8 drachms, corresponding exactly with that of the heaviest heart examined by Dr. Peacock, and by Dr. Hope. (*Ed. Monthly Journ.*, Oct. and Nov. 1854, pp. 323 and 406.) The cavity is sometimes expanded sufficiently to hold a large orange, or the fist.

When the whole heart is affected, it usually assumes a somewhat globular shape, the apex being nearly or quite obliterated. It also takes a transverse position in the chest, when considerably dilated, as the diaphragm does not allow it to descend. When one side is greatly enlarged, and the other sound, the latter appears like a mere appendage to the former, sometimes not extending more than half its length. The fleshy columns are sometimes thickened, sometimes stretched out and attenuated. The valvular orifices expand with the cavities; and the valves themselves usually increase in magnitude, so as to close the orifice, and support the increased pressure; but, in cases of great dilatation, this coaptation does not always take place, and the valves are sometimes imperfect, so as to allow of regurgitation.

Simple Dilatation.—Passive Aneurism. (Corvisart.)—In this affection, the walls of the heart are simply distended or stretched out, without any addition of substance. They are, therefore, thinner than in health; and the degree of attenuation is proportionate to that of dilatation. It is very rarely indeed that the whole heart is thus affected. The right ventricle is said to be more frequently dilated than the left, but both together more frequently than either separately. The auricles, though they yield more easily to any distending force, are less subject to the disease than the ventricles, in consequence of being less exposed to the causes. The left auricle is more apt to be affected than the right, because the mitral valve is more frequently deranged than the tricuspid, and the distending force of the left is greater than that of the right ventricle. The fleshy columns appear as if stretched; the interventricular septum is less attenuated than the walls; and the valvular orifices, even more frequently than in hypertrophy with dilatation, are enlarged in greater proportion than the valves themselves, so as to be imperfectly closed, and thus permit regurgitation of the blood.

The degree of dilatation is sometimes very considerable, but not equal to that which may occur in connection with hypertrophy. The heart has been known to attain three times its natural size. The walls are in some instances very thin. Those of the left ventricle have been reduced to a thickness of two lines; and in some places, especially at the apex, the muscular fibre has been occasionally quite wanting; the external and internal membranes being in contact, or only separated by a deposit apparently intended to give them additional strength. As in hypertrophy with dilatation, the heart is apt to assume a roundish form, and a transverse position in the thorax.

The heart is sometimes found greatly distended with blood after death, with-ut having suffered dilatation. The former condition may be distinguished rom the latter by the disposition evinced to return to the ordinary size when mptied, whereas the dilated walls do not contract under similar circumstances.

Pure dilatation, unmixed with hypertrophy, is comparatively rare; but, for practical purposes, all those cases in which the peculiar phenomena of dilatation predominate may, with propriety, be ranked under this head.

The muscular fibre in this affection is usually pale, softened, and flaccid, sometimes, however, purplish or violet, as if congested in common with most of the other great organs. It is sometimes affected with fatty degeneration. The heart collapses when empty. In some instances, the distension has been so great as to produce a rupture of the walls, and effusion of blood into the pericardium.

Partial Dilatation.—Aneurism of the Heart.—The term aneurism applied to ordinary enlargement of the heart is not correct, as there is no analogy between that affection and the disease of the arteries to which the name properly belongs. Such an analogy, however, is strikingly exhibited by the partial dilatation now under consideration, which has, therefore, very properly been named aneurism of the heart by recent writers. To Mr. Thurnham the profession is indebted for the precision which has been introduced into the pathology of this affection. It consists of a pouch, produced by the dilatation of a portion of the walls of one of the cavities, and usually forms a tumour on the surface of the heart, though sometimes scarcely projecting, being formed in the wall itself by the expansion of the inner membrane, and the absorption of the muscular tissue before it. Generally only one pouch exists, but instances have been recorded in which there were two or more. They vary greatly in size, from the smallest dimensions up to those of an orange, or of the heart itself. Sometimes all the constituents of the walls are distended, including the muscular tissue; sometimes this is wanting, and the sac consists of the outer and inner membranes; and again the endocardium is ruptured or ulcerated, and the parts exterior to it dilated. In some instances, adhesions have been formed with the loose portion of the pericardium; in others, the tumour has opened into the cavity formed by that membrane. The sac often contains laminated coagula of blood, especially when its mouth is narrow. The tissues of the heart are found variously degenerated; either the endocardium, or muscular layer, or both, exhibiting organic changes. An instance in which a complete spontaneous cure of a proper aneurism of the heart appears to have taken place is recorded in the *Lond. Med. Times and Gaz.* (Nov. 1856, p. 479).

Symptoms.

It will best conduce to an accurate understanding of the subject, to detail first the general symptoms common to the affections above mentioned, and afterward, so far as they can be distinguished, those peculiar to each.

The disease usually makes its advances very slowly. In the beginning, the patient complains only of occasional palpitations, dyspnœa, and perhaps slight precordial pain, stricture or other uneasiness, induced by some unwonted muscular exertion, mental excitement, or excess in eating or drinking, and sometimes without any obvious cause, especially at night. He finds himself unable to run, or mount hills, or ascend flights of stairs, with the same facility as before, and is more readily fatigued by ordinary exercise. These symptoms, however, are at first seldom sufficient to excite alarm. It is a fact noticed by Dr. Hope, that, though at the commencement of active movement the patient may experience some of the inconveniences alluded to, he often loses them by a continuance of the exertion, in consequence probably of the blood being more strongly diverted to the surface. The disease may remain long in this state, sometimes, indeed, to extreme old age, if great care is taken to regulate the habits of body and mind; but it often gradually increases; slighter causes induce the peculiar symptoms; and the palpitations and dyspnœa at length become habitual, being either induced by the least excitement, or never entirely absent, though still liable to remissions and exacerbations. The throbbing of the heart is almost always sensible to the hand applied to the præcordia, and often visible to the eye; and occasionally it is so violent as obviously to agitate not only the chest but the whole frame. Acute pains, like those of angina pectoris, shoot in some instances through the chest, and into the left arm; and, when these are wanting, the patient often complains of dull pain, oppression, tightness, weight, or other uneasiness about the præcordia or epigastrium.

The pulse is very differently affected, being sometimes full and strong, sometimes soft, small, and feeble, generally regular and little increased in frequency in the early stages, except during paroxysms of palpitation, but at an advanced period often becoming intermittent and irregular, and always so in cases in which certain kinds of valvular disease are connected with that of the muscular tissue.

Along with these symptoms, which proceed immediately from the heart, the patient experiences many others resulting from various secondary affections. The head generally suffers more or less, either from excess or deficiency of arterial blood, or from venous congestion. Hence, headache, vertigo, ringing in the ears, flushed or pallid face, swollen features, prominent and watery eyes, frequent attacks of epistaxis, and, in the advanced stages, not unfrequently faintness or partial syncope, mental hebetude, drowsiness, stupor, coma, and finally apoplectic effusion.

The lungs are almost always sooner or later involved. The blood is driven into them too forcibly, or, escaping with difficulty through the pulmonary veins, becomes congested in their vessels. The proper function of the lungs is thus impeded; effusion of serum or sero-mucous fluid, or of blood, takes place into the bronchia and air-cells; serous liquid is often poured out into the areolar tissue of the lungs or into the pleural cavities, and bronchitis, pneumonia, or pulmonary apoplexy, may be added to the already formidable list. Dyspnœa, cough, expectoration more or less copious and difficult, hæmoptysis active or passive, disturbed sleep, sudden startings at night, horrible dreams, great uneasiness in the horizontal position, and occasionally complete orthopnœa, are the consequent symptoms. Indeed, many cases, such as were formerly considered as asthma, are nothing more than chronic dyspnœa, dependent on disease of the heart. It is not difficult to understand the source of this disorder of respiration. The augmented size of the heart, the sanguineous congestion of the lungs, the collection of fluid in the air-cells, bronchial tubes, and intervesicular tissue, the consolidation from pneumonia, and the pressure from pleuritic effusion, all may contribute their part, some in one case and some in another, in preventing the proper access of air to the blood; while, from the mechanical obstacle opposed by the cardiac disease, the blood itself is detained in the lungs, and often cannot pass on in due quantity to fulfil its office in all parts of the system. From the lungs, therefore, from the heart itself, and from all parts of the body, goes up by the afferent nerves an impression to the nervous centres, which excites in these the painful sense of want of breath, and leads to violent reflex actions in the respiratory organs, for the purpose of supplying the deficiency. These severe respiratory symptoms occur more or less paroxysmally, being brought on by accidental influences disturbing the cardiac functions, and not unfrequently without appreciable cause.

But the organs mentioned are not the only ones affected. Congestion of the liver, stomach, bowels, and kidneys, either active or passive, but especially the latter, gives rise to numerous symptoms indicative of derangement in these viscera. Hence dyspeptic sensations in the epigastrium, irregular appetite, nausea and vomiting, constipation or diarrhœa, obvious enlargement of the liver, jaundice, disordered alvine evacuations, melæna, albuminous urine, and hemorrhage, usually of the passive kind, from the stomach, bowels, and urinary passages. It is not pretended that all these phenomena are present in every case; but every one of them, and many others of a similar origin, make their appearance occasionally in one or another case of heart disease. It has, indeed, been ascertained by Dr. Clendinning, as the result of dissection, that hypertrophy of the viscera mentioned is very apt to ensue, in consequence of the sanguineous congestion to which they are exposed.

At length a universal disposition to dropsical effusion is developed. The venous system everywhere loaded, or the arterial capillaries everywhere distended, relieve themselves by the extravasation of the serous portion of the blood. Edematous swelling, first showing itself as a general rule in the feet, gradually extends upwards, until it involves at length the whole body, including not only the areolar tissue, but often the serous cavities also. The urine becomes scanty and high coloured, and the skin dry, as in dropsy from other causes. The distress from shortness of breath now becomes extreme; the paroxysms of cough and dyspnœa increase in violence; the patient, unable to lie down in bed, often sits day and night, with his body bending forward, and his head supported, harassed by want of rest, and the dread of impending suffocation; the chest heaves with the forced inspirations, and the body shakes under the tremendous impulses of the heart. The appetite fails, the pulse sinks, the skin becomes cool, and the lips and extremities assume a purple or livid hue. Finally, one of the great vital organs, the brain, the lungs, or the heart, sinks under the overwhelming burden; and death, often preceded by stupor or delirium, closes the long series of suffering.

Happily, it is not always that the patient is exposed to these protracted and most painful struggles. Death not unfrequently surprises him at a comparatively early period, and before he has yet suffered greatly. Sudden death is, indeed, one of the characteristics of heart affections. The patient, perhaps wholly unconscious of the nature of his complaint, supposing himself to be affected with asthma, or chronic catarrh, or dropsy in the chest, or possibly only with weakness, is suddenly seized, while walking in the street, or resting in his chair, or in his bed at night, with a sense of faintness, which soon becomes perfect insensibility, and life is often extinct before relief can be obtained. Such a result sometimes proceeds from a rupture of the heart; but more frequently it is only a prolonged intermission, if we may so express ourselves, of the heart's pulsation. It is a continued syncope. Apoplexy is another mode which nature has kindly provided for escape from protracted suffering. It frequently happens, moreover, that some intercurrent inflammatory disease, which might prove harmless if occurring in health, is rendered fatal by the cardiac complication.

In the last stages of the dropsical affection, the distended skin of the lower extremities sometimes gives way, either by rupture, ulceration, or inflammation followed by sloughing; and considerable relief is obtained from the more violent symptoms by the escape of serum through the openings. In such instances, however, death almost always follows in a short time, though in a mitigated form, from the exhaustion of the discharge, and of the irritative fever. Sometimes gangrene of the lower extremities takes place, independently of the mere effusion, being the direct result of the impeded circulation.

In the more complicated cases above described, the muscular affection of the heart is very often associated with disease of the valves, and it is by the united influence of the two forms of derangement that the symptoms are produced. It is, in fact, in this way, that organic valvular disease, when it is to end fatally, generally terminates.

Special Symptoms of Hypertrophy.—So far as relates to treatment, it is sufficient to point out the symptoms, characteristic severally of hypertrophy and dilatation, without attempting a more minute diagnosis. But, as the two affections are often united in various degrees, it is not always possible to draw a precise line between them. We must, therefore, be content with referring to the head of hypertrophy those cases in which, though there may be great dilatation, the symptoms characteristic of an excess of the muscular tissue predominate; and to that of dilatation those in which the characteristic phenomena of the latter affection prevail, though there may actually be some degree of hypertrophy present. It is of no consequence to know that, in a case of enlarged heart, the absolute quantity of muscular fibre is greater than in health, provided all the indications of treatment, deduced from the symptoms, are the same as in pure dilatation.

The effects of hypertrophy, when not complicated with valvular disease, or fatty degeneration, are those of excessive action of the heart. The additional muscular fibre gives additional energy to the heart's contractions, and consequently increased force to the current of blood. In hypertrophy of the left ventricle or of both, the pulse is full, hard, strong, and prolonged, suggesting in its highest grades the comparison of the stroke of a sledge-hammer, and so characteristic of its cause, that its existence should always lead to the suspicion of cardiac disease. It is said, moreover, to be less changed than the healthy pulse by difference of posture, and sometimes not to be changed at all. In the earlier stages, the health does not appear to be materially impaired. On the contrary, there is often a show of increased vigour in the functions generally, consequent upon the more rapid supply of blood to all parts of the body. Yet, besides the pulse alluded to, the patient shows signs of the disease in the occurrence, now and then, of vertigo, headache, or other sensorial disturbance, especially when stooping, and in occasional bleeding from the nostrils. When the complaint is in full force, the cephalic symptoms are highly characteristic. They are such as result from active determination of blood to the head, and not from venous congestion. The face is flushed, and of a bright-red or purplish hue, though sometimes, when naturally very pale, it is but little coloured; the features are swollen; the eyes projecting and brilliant, and occasionally inflamed; the carotids beat with great force; and the fulness and tension of the cerebral arteries are said occasionally to result in attacks of apoplexy. The lungs suffer less than the brain in hypertrophy of the left ventricle, because their main supply of blood is from another source; and the same may be said of the liver; though both these organs suffer occasionally from venous congestion, consequent upon disease of the mitral valves, associated with hypertrophy. It may be stated, in general, that all the parts freely supplied with arterial blood are kept in a state of tension and excitement, highly favourable to the occurrence of inflammation or hemorrhage. It is asserted that the kidneys are generally enlarged in hypertrophy of the heart, and often undergo the kind of degeneration designated as Bright's disease. Dropsical symptoms often also result from this affection, though at a more advanced period, and to a less extent than in dilatation.

Various circumstances modify the above symptoms. When the hypertrophy is attended with contraction of the cavity of the ventricle, the pulse, though tense, is necessarily small from the diminished amount of blood sent forth at each ventricular systole. Disease of the valves also has a powerfully modifying influence. In mitral regurgitation, the force of the ventricle is partly expended in a backward direction; and, while congestion of the lungs thus results through the left auricle and pulmonary veins, the symptoms indicative of powerful arterial action are less observable in the pulse, in the head, and indeed throughout the system. In stricture of the aortic orifice, the smallness of the opening counteracts, in some measure, the force of the ventricle, and the pulse, though firm, is not so full as in pure hypertrophy, and the brain suffers less. It is said that the hypertrophy of the ventricle may be so exactly balanced by the contraction of the orifice, as completely to neutralize its peculiar influence, and little deviation from health will be observed in the system at large, excepting merely a preternatural hardness of the pulse. When there is insufficiency of the aortic valve, and consequent regurgitation, a portion of the force of the ventricle is by reflection expended on itself, and less blood passes onward. Hence the pulse, though strong from the ventricular impulse, is less full and prolonged than in pure hypertrophy, and has a quick, jerking character. The brain in this case also receives less blood, and consequently suffers less than when the valve of the aorta is unaffected. In these valvular affections, moreover, the pulse differs from the purely hypertrophic pulse in being frequently irregular and intermittent.

Hypertrophy of the right ventricle exclusively has no direct effect upon the arterial circulation through the body, and consequently wants entirely the characteristic symptoms of the same disease in the left ventricle. It was inferred theoretically that it must occasion in the lungs effects similar to those produced in the brain by the latter affection, namely, active congestion, hemorrhage, and a tendency to inflammation; but observation has not fully confirmed this opinion. The comparative absence of these results in the lungs has been ascribed to the incomplete closure of the tricuspid valve, admitting of regurgitation, and consequently of a division of the ventricular force. But by this reaction through the tricuspid valve, the impulse is directed towards the brain, which thus suffers from venous congestion, and pulsation is imparted to the jugular vein. Though the patient, therefore, may suffer with vertigo, headache, &c., yet the face, instead of being turgid with red blood, is pale, or of a dusky hue, and the lips are purplish or livid. A double pulsation of the jugular vein, the first being weak and corresponding with the auricular systole, the second stronger and synchronous with that of the ventricle, may be considered as one of the most characteristic signs of hypertrophy, or of this with dilatation, of the right side of the heart.

The *physical signs* of hypertrophy differ with the degree in which the heart is enlarged. In *simple hypertrophy*, the impulse is usually much stronger than in health, and may be felt over a somewhat larger extent of the chest. In some cases, however, though strong under excitement, it is, under ordinary circumstances, calm, or scarcely perceptible. When the heart is contracted, as well as hypertrophied, the impulse is usually feeble. There is little or no observable alteration of the healthy resonance under percussion. But the sounds are materially changed. In consequence of the thickness of the ventricular walls, the first sound is prolonged and very dull, occasionally indeed almost wanting. The second sound is also more feeble, and the interval of silence is shorter. In *hypertrophy with dilatation*, the field of impulse is extended in proportion to the expansion of the heart. There is a sensation of slow, heaving, and forcible movement imparted to the hand, and, when the ear is applied to the chest, the head of the observer may be seen distinctly to rise with every systole of the heart. The surface of the chest is often visibly elevated and depressed; and the whole chest and even the whole frame of the patient are sometimes observably shaken. According to Skoda, in order that the chest may be heaved with sufficient force to raise the head of the ausculter, there must be hypertrophy and dilatation of both ventricles. Dr. Hope noticed a sort of sudden shock following the recession of the impulse, which he ascribed to the quick refilling of the ventricle during the diastole.* The impulse is diminished, in the advanced stages, in consequence of the supervention of debility of the heart, and is occasionally masked by emphysema of the lung, though the latter is a very rare event. Percussion is dull to a greater extent than in health, sometimes over a space three or four inches in diameter, and, in extreme cases, from the third to the seventh or eighth rib. The sounds of the heart are heard over a wider space than in the normal state of the organ. They are loud in proportion to the thinness of the walls; and, when the dilatation is considerable, with no great increase of thickness, a greater loudness of the first sound is produced than results from any other derangement of heart. Auscultation should be resorted to, in these cases, when the heart is most tranquil. When the organ is excited, the sounds are sometimes heard by the patient, and by others at some distance from him. In very bad cases, a prominence may often be noticed in the precordial region. In such cases, according to Dr. Hope, there is often adhesion to the pericardium, which prevents the heart from falling, and thus causes its expansion to be directed against one point of the chest. A prominence from this cause may be distinguished from that resulting from pericardial effusion, by the continuance of the respiratory murmur over the former, while it is wanting over the latter; the lung overlapping the heart in one case, and being wholly displaced in the other. When the valves are diseased, their peculiar murmurs mingle with the hypertrophic sounds.

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* According to the theory of diastolic impulse, this secondary shock may be readily explained by referring it to the systole, forcing the blood into the great vessels, which, reacting on the base of the heart, move the whole organ forward. (*Note to the third edition.*)

It is not always easy to distinguish hypertrophy of the right from that of the left ventricle by the physical signs. But, when the impulse and dulness on percussion are increased exclusively to the right of the precordial region, or behind the lower portion of the sternum, we may infer that it is the right ventricle that is principally affected; while a similar extension towards the left side will indicate the corresponding ventricle as the seat of the disease; and the diagnosis will be much aided by attention to the general symptoms already alluded to. It may sometimes be important to form a correct diagnosis in relation to hypertrophy of the right ventricle when it exists alone; for, as the symptoms of excessive vascular action and arterial congestion of the brain and other organs, which guide to a proper practice in hypertrophy of the left cavities, are wanting in that of the right, and yet the real indications of treatment may be the same, it is only by recognizing the existence of the latter condition of the heart, that we are likely to pursue the correct therapeutical course.

Special Symptoms of Dilatation.—The peculiar characters of dilatation have their origin either in the feebleness of the heart's contractions, or in venous congestion. The attenuation of the muscular tissue, as well perhaps as the condition of the tissue which led to the attenuation, is calculated to diminish its power; and the accumulation of blood in the cavities of the heart, consequent upon this very debility, has a tendency to check the onward current in the rear. When the left side is dilated, the arterial blood is distributed with insufficient force, and in insufficient quantity through the branches of the aorta, whence arise symptoms of a want of aerated blood in the brain, and in fact in all parts of the system; while, at the same time, the pulmonary veins become loaded, and congestion extends backward successively to the capillaries of the lungs, to the pulmonary arteries, to the right cavities of the heart, and thence to the veins of the whole body. Dilatation of the right side throws back the venous blood upon the brain, liver, kidneys, stomach and bowels, and the venous system at large; while the pulmonary circulation, and consequently the arterial side of the heart, and the arteries generally are badly supplied, and the blood itself becomes anemic, from enfeebled digestion and assimilation. Hence arise the soft, weak, and not unfrequently, especially in the advanced stages, small and irregular pulse; the feeble prolonged palpitations; the general feeling of debility, and tendency to faintness or syncope;

the paleness of surface and coolness of extremities; the pallid, dusky, or livid hue of the countenance; the purple lips; the dyspnœa and bronchorrhœa of pulmonary congestion; the mental hebetude, dejection, drowsiness, &c. of a feeble or congested brain; the nausea, vomiting, and other dyspeptic symptoms arising from an oppressed stomach; the general tendency to passive hemorrhage from the mucous membranes, whether of the air-passages, the alimentary canal, or the urinary organs; and, finally, the universal dropsical effusion, arising from the loaded veins and watery blood, and forming so prominent a feature in cardiac affections. Dilatation of the right ventricle is very apt to be attended, either as cause or effect, with various diseases of the lungs and liver; as chronic bronchitis, emphysema, dilated bronchia, congestion, inflammation, hemorrhage, &c. of the former, and great enlargement with disordered or defective secretion of the latter.

The general symptoms enumerated are insufficient to enable us to discriminate between dilatation of the left and of the right ventricle; nor is such a discrimination a point of any great practical importance. Perhaps the most characteristic general sign of dilatation of the right ventricle is the constant tension of the external jugular, without pulsation, and not disappearing when pressure is made upon the vessel in its upper part.

In moderate cases of dilatation, the patient often continues for a long time without other signs of disease than slight symptoms of asthma, occasional palpitations, a pale or sallow hue of the face, and a feeling of greater or less general debility.

The reader must guard himself against the impression, that the characters above given as those of hypertrophy and of dilatation respectively, are to be commonly met with unmixed in nature. Though sometimes found isolated, they are much more frequently mingled in the same case, because both elements usually exist more or less together, either in the same cavity, or in different cavities of the heart; and, in forming his therapeutical conclusions, the practitioner must endeavour to ascertain which element preponderates, and act accordingly.

The physical signs of dilatation, compared with those presented in health, are an impulse usually felt over a larger space, but soft, neither forcible nor heaving, and sometimes, in very feeble cases, quite wanting; more extensive dulness on percussion; and, when the thinning of the walls is not attended with greatly enfeebled action, louder and clearer sounds of the heart, which are also heard over a larger portion of the chest. In relation to percussion, care is necessary to avoid fallacy from consolidated or compressed, and from emphysematous lung, the former of which occasions dulness, the latter sometimes masks it when existing. To obviate these sources of error, the patient should be told to lean forward, and to make a full expiration, so as to withdraw the lung from before the heart, and bring this into contact with the walls of the chest. In regard to the sounds, it is the first or systolic sound which is chiefly affected. It is quicker and shorter than in health, and bears a closer resemblance to the second sound, from which it is sometimes scarcely distinguishable except from its relation to the pulsation, or from its position; the first sound being most distinct a little above the apex of the heart, the second over the semilunar valves near the insertion of the third rib, and thence up the sternum. In judging of the loudness of the sound, it should also be remembered, that this quality is increased by the intervention of compressed or consolidated lung, which conveys sound better than the loose pulmonary tissue. In extreme thinness of the walls of the heart, the first sound, instead of being loud, is sometimes very feeble, in consequence of the very feeble contraction. The bellows murmur is often heard in dilatation, partly in consequence of valvular disease, but sometimes also without any valvular disease whatever, when it may possibly depend on the anemic state of the blood, which is common in this affection.

The different position of the dulness and sounds may serve to distinguish dilatation of the right from that of the left ventricle, as well as the symptom already alluded to of turgescence of the external jugular. Dilatation of the auricles may be suspected, when there are signs of disease of the auriculo-ventricular valves, along with those of dilatation in general. Dr. Stokes relates a case, in which dilatation of the right auricle was attended with a distinct diastolic impulse between the second and fifth ribs on the right side.*

It has been thought that the position of the impulse also indicated the side of the heart affected, when on the left side, proceeding from disease of the left ventricle, and when behind the sternum, from that of the right. But the fact appears to be that the point of impulse depends, not on the part of the heart dilated or hypertrophied, but on the general position of the whole organ, whether horizontal or vertical; being in the former case on the left side, and in the latter behind the sternum. Enlargement of the heart itself, when considerable, has a tendency to produce the horizontal position, and consequently an impulse on the left; but various other circumstances extraneous to the organ control this tendency, such as pleuritic effusion, pneumothorax, and emphysema, which push it towards the side opposite to their own, and, when on the left side, render it vertical under the sternum, and abdominal distension from any cause, which pushes it upward, and renders it consequently more horizontal. (*Skoda.*)†

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* On the theory of the diastolic impulse of the ventricles, this is what might be expected. The diastolic impulse above referred to occurs immediately after the ordinary impulse of the heart. If this is diastolic, of course the auricular impulse must have occurred during the immediately following systole of the ventricle, which produced it by sending a regurgitant current towards the auricle, or simply by abruptly closing the tricuspid valves. Such an impulse or shock of the auricle was observed in the case of Mr. Groux, in whom a defect in the sternum permitted an examination of the actions of the right auricle. (See *Med. Times and Gaz.*, Nov. 1857, p. 522.)—*Note to the fifth edition.*

† *Asystolie* (M. Beau). There is a special condition of system to which this name has been given by M. Beau, and which, though not unknown to most practitioners, and included, as regards its several parts, in different portions of the text of this work, has not, perhaps, in the aggregate received the attention which it merits. It has recently been investigated by Prof. Parrot, of Paris, of whose account, based on a careful observation of seven cases, and consigned to the two numbers of the *Archives Générales* for April and May, 1865 (pp. 385 and 550), the following is a summary.

Symptoms. Excessive difficulty of breathing, with orthopnœa and violent action of the inspiratory muscles; moist, injected, and prominent eyes; the mouth half open; the face bluish, especially the lips and nose; speech difficult and interrupted; the feet and hands cold and cyanosed; the jugulars permanently distended, and pulsating synchronously with the artery at the wrist; more or less œdema, sometimes general, and always decided in dependent parts; a frequent, small, intermittent, and extremely feeble pulse, vanishing under light pressure, and sometimes scarcely to be felt; derangement of the heart, indicated by enlargement, irregularity and weakness of the normal sounds, and pulsations sometimes feeble, sometimes violent and tumultuous; such is an epitome of the more obvious and characteristic phenomena of the affection.

There is one additional symptom, however, which appears to have escaped the attention of M. Beau, but which M. Parrot has found in all the cases, and considers characteristic. This is a soft bellows murmur, heard in general most distinctly in the fourth interspace immediately to the left of the sternum, but sometimes in the fifth interspace or over the xyphoid; in some instances extending a short distance upward, but never far from its centre of greatest intensity; replacing, where heard most strongly, the first normal sound, but elsewhere leaving both normal sounds undisturbed; of short duration, and belonging to the first time in the heart's action. Besides this cardiac murmur, there are copious bronchial and tracheal rales, which, in the last stage, become so excessive as completely to obscure the cardiac sounds. The left side of the heart is sound.

Post-mortem examination shows the right side of the heart, especially the ventricle, considerably dilated, and the auriculo-ventricular orifice so much enlarged that it could no longer be closed by the tricuspid valves. These are the only discoverable lesions; and

Partial dilatation or *aneurism of the heart* cannot be distinguished, with an approach to certainty, by any signs during life.

It should be borne in mind, in forming a diagnosis in diseases of the heart, that the import of many of the signs is very much modified by various organic affections exterior to the heart. Thus, tumours aneurismal or otherwise, and partial pleuritic effusions behind the heart, may push it forward, so that a larger portion shall be in contact with the chest, and thus occasion increased impulse, and dulness over a greater extent than in health. By similar causes, the heart may be removed laterally in either direction from its normal position, or may be thrust upward or downward, so as to vary the point at which its impulse may be felt, and its sounds heard. The effects of pulmonary consolidation or compression, emphysema of the lungs, and effusion into the pericardium, in obscuring the diagnosis, have been already noticed. In relation to the last-mentioned affection, it may not be amiss to repeat that, along with the dulness on percussion which it has in common with enlargement of the heart, there are the distinguishing symptoms of the comparative feebleness and distance of the sounds of the heart, and the entire absence of those of respiration. Finally, it is often extremely difficult to decide between organic and functional derangement of this organ; as, in nervous and anemic cases, and under strong excitement, the heart not unfrequently presents phenomena which closely correspond with those enumerated among the characters of its anatomical changes. This subject will be treated of more fully under functional diseases of the heart.

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to these, therefore, the cardiac phenomena must be ascribed. The venous pulse, which was not only visible, but sensible to the touch, persisted in all instances to the last.

Cause and Nature. It was clearly ascertained that these cases did not originate in rheumatism. Indeed, we must look for the source of the affection beyond the heart itself; for the lesions presented by this organ were insufficient to explain all the phenomena. In all the cases, the source of the affection could be traced to the lungs, and was found to consist in pleural adhesions, hypertrophy of the connective tissue (cirrhosis of the lungs), chronic bronchitis, emphysema, or miliary tubercles. These diseases are all such as oppose impediments to the capillary circulation, and the introduction of air into the air-cells. Hence, as the blood could not be duly transmitted, congestion in the pulmonary arteries, the right side of the heart, and the venous circulation generally. The left ventricle, not sufficiently supplied with blood, was, as it were, wilted. The right ventricle, at first stimulated by the excess of blood and thus hypertrophied, was gradually distended, so as at last to materially weaken the contractile power; and fatty degeneration of the muscle was superadded to confirm the debility. The tricuspids having their insertions removed further from the centre of the auriculo-ventricular opening, were unable to close it; and the difficulty was increased by the enlargement of the opening itself. Hence a steady pressure on the venous column, maintaining the distension of the jugulars; and, the vena cava also being enlarged so that its valves became insufficient, the cardiac impulse was carried backward, and produced the venous pulse.

As assistant causes in the production of the affection, M. Parrot mentions unwholesome dwellings, insufficient food, and excessive labour.

The symptoms in these cases are even more aggravated than in original cardiac affections of the tricuspid valves. In the latter, if the mitral valve remain sound, the pulse may be regular and full; for, though the supply of blood to the left side of the heart may be deficient, that which is sent has been duly changed in the lung; while in the *systolic cases*, as the difficulty begins in the lungs, the blood which passes through them, and reaches the left ventricle, is imperfectly oxidized; and the very tissue of the heart, therefore, is supplied with a blood unfit to support it. Hence, the pulse is here small, frequent, feeble, and irregular; and the whole system suffers accordingly.

The obvious therapeutical inference is that remedies must be addressed not mainly to the heart, but to the pulmonary disease; and if this is remediable, a cure may be effected: though, unhappily, from the nature of the lung-disease, or the advanced stage in which the case comes under notice, this is not often to be looked for. (*Note to the sixth edition.*)

Causes.

The causes of hypertrophy and dilatation are often the same, though operating upon different principles. Whatever stimulates the muscular action of the heart may produce the former affection, whatever has a tendency to distend the walls may produce the latter. Now no stimulus, probably, is greater to the muscular fibres than the pressure of the blood within the cavity which they surround; and no cause tends more strongly than this to produce distension. It is not surprising, therefore, that the two conditions of hypertrophy and dilatation often coexist in the same portion of the heart's structure. Whether one or the other shall predominate, depends chiefly upon the degree of constitutional vigour, and of the consequent tonic cohesiveness of the cardiac tissue. When these are great, the tendency is to the increase of the muscle, when feeble, to its distension; and it may happen that the power of resistance on the part of the muscle shall be sufficient to prevent all dilatation, or so exceedingly feeble as to offer scarcely any impediment to the process; so that we may have pure hypertrophy or pure dilatation. It is not unlikely that, in many cases of enlarged heart, where both the walls are thickened and the cavities increased, the result may be one of over-action alone; for the natural result of the growth of a circular fibre is to enlarge the circle within it, as its length is greater than its thickness, and the growth will probably be proportionably greater in the former than in the latter direction. Besides, there may be many causes of stimulation to the muscular fibre which have little or no effect in distending the cavity; and it is therefore easy to account for the fact, that pure hypertrophy is not very unfrequent. Distension of one of the cavities must always be a stimulus to the muscular walls; therefore pure dilatation is comparatively rare.

Special Causes of Hypertrophy.—Among the causes which immediately stimulate the heart, and may therefore operate in producing hypertrophy, are excessive and continued muscular exertion of any kind, exciting passions, sensual indulgences, excess in the use of stimulating food and drink, and nervous disorder giving rise to obstinate palpitation. Inflammatory irritation may have the same effect. Hypertrophy of structure is one of the natural results of a certain degree of irritation. Rheumatism and gout, but especially the former, undoubtedly affect occasionally the muscular tissue of the heart, and give rise immediately to this result. The affection may be original in this organ, or may be translated to it from some external part. An extension of irritation, whether rheumatic or not, from the inflamed pericardium or endocardium to the muscle, may also develope hypertrophy in the latter. It is not impossible that repelled eruptions may sometimes operate in this way. The frequent association of hypertrophy of the left ventricle with Bright's disease, without any disorder of the cardiac valves, would seem to imply some causative agency in the latter affection. It may be conceived that this exists in the irritating state of the blood from ureous impregnation, or in its frequently anemic state, which indirectly acts as a powerful stimulus to the heart, or possibly in obstruction in the systemic capillaries, arising, as some suppose, from the changed character of the blood, which interferes with its circulation through the extreme vessels.

There are some causes which are to a certain extent mechanical. Anything which impedes the current of blood, and causes it to accumulate in one of the cavities of the heart, may, for reasons already mentioned, produce hypertrophy. Anything which diverts the current of blood from its due course may have the same effect, by bringing into play the sympathies that connect the heart with the rest of the body, and are intended to secure a due supply of blood to all its parts. It is on these principles that structural derangement of the valves, and of the great blood-vessels near the heart gives rise to the disease in question. The valves either impede the passage of the blood by their constricted orifices, or admit of its regurgitation by their insufficiency. Stricture of the aortic valvular orifice, or of the aorta itself, by causing an accumulation of the blood in the left ventricle, is a fruitful source of hypertrophy of that cavity. The effect is, in this particular instance, increased by the augmented quantity of blood that is driven into the substance of the heart through its coronary vessels, in consequence of the excitement of the ventricle. Imperfection of the aortic valves, so as to permit regurgitation, has the same result, by throwing back upon the ventricle a portion of the blood, while the ventricle is stimulated to increased action by the wants of the system. Contraction at the mitral valves causes accumulation in the left auricle, which thus becomes hypertrophied and dilated; and the congestion, extending backwards through the lungs to the right side of the heart, occasions congestion and hypertrophy of the right ventricle. Sometimes it happens that, while the right ventricle is hypertrophied and dilated from this cause, the left becomes thickened and contracted. The cause of the contraction is obviously the deficient supply of blood, in consequence of the narrowing of the mitral orifice; that of the hypertrophy is not so clear. Perhaps it is the sympathy which binds all parts of the heart in harmonious action, and causes the left ventricle to share in the same irritation which is stimulating the right; perhaps it is the wants of the system, insufficiently supplied with blood, stimulating the ventricle through the nervous centres. Deficiency of the mitral valves, with regurgitation, leads to increased efforts on the part of the left ventricle, consequent on the partial diversion of the current from its legitimate course, and to augmented pressure upon the corresponding auricle, which not only receives more than its due share of blood, but is subjected also in a degree to the ventricular force to which it is altogether unaccustomed. Hence, both these cavities may become diseased, the ventricle being hypertrophied, and the auricle both hypertrophied and dilated. In the same manner, precisely, disease of the right valves may induce disease of the right cavities; but, as the former is much less common than upon the left side, so also is the latter. From the observations of Dr. Clendinning, however, it may be inferred that hypertrophy, though not unfrequently the result of valvular disease, proceeds in a much larger proportion of cases from other causes. Of about 140 cases of hypertrophy, only about 30 presented well-marked disease of the valves.

Obstruction of the lungs operates in producing hypertrophy on the same principles precisely as disease of the valves; namely, by impeding the onward course of the blood, and thus producing congestion in the right cavities of the heart. Hence, chronic bronchitis, pulmonary emphysema, asthma, artificial pressure upon the chest, &c. rank among the causes of this disease. Any obstruction in the systemic capillaries must have a similar effect by stimulating the left ventricle through the nervous centres. Dr. Gairdner has suggested, as another cause for cardiac distension, the expanding force of inspiration, when the lung is diminished in capacity, as in the partial collapse often attendant on bronchitis. (*Brit. and For. Medico-chirurg. Rev.*, April, 1853, Am. ed., p. 371.) It may be considered singular that phthisis, in which so large a portion of the lungs is often destroyed, and so small a portion left capable of carrying on the circulation, does not tend to produce disease of the heart. The reason probably is, that the quantity of blood becomes in this complaint gradually accommodated to the capacity of the lungs, and congestion of the heart is thus avoided.

Permanent dilatation of the right side of the heart sometimes occasions distension of the left, with its necessary results, by pressing on the aorta.

action. It has already been stated that the anemic condition favours the production of hypertrophy of the heart.

But moderate bleeding is highly important. Six or eight ounces may be taken, according to the degree of plethora, once or twice a month, or less frequently. Should pain exist about the heart, it would be best to take this amount of blood by cups or leeches between the shoulders, or upon the breast; under other circumstances, it should be drawn from the arm.

In the intervals between the bleedings, saline cathartics should be employed in moderate doses, once or twice a week, or oftener. They diminish the volume of the blood, without depriving it too much of its nutritive matter; and sometimes afford great relief to the patient. Sulphate of magnesia or bitartrate of potassa may be used. The latter has the advantage of stimulating the kidneys as well as of operating on the bowels, but is probably rather more disposed to derange digestion.

A low diet is also highly important, indeed indispensable. It should, however, be regulated according to the condition of the blood. When this is rich and in excess, it should consist exclusively of vegetable food; but, as one great object is to prevent the production of anæmia and nervous or dyspeptic disorder, which have a tendency to agitate the heart, it becomes important not to carry restriction too far; and, should the strength begin to fail, and the face to assume a pallid hue, milk should be allowed, with occasionally some fish, or perhaps a soft-boiled egg. Small quantities of meats may be given in cases with more decided symptoms of depression; but in no case should the diet be stimulating. In all doubtful cases, the practitioner cannot go far astray by confining the patient to milk and the more digestible vegetable substances. All kinds of stimulating drinks, including tea and coffee, should be strictly forbidden; and spices should be very sparingly employed, if at all.

Absolute rest is not desirable; as it favours the generation of dyspeptic and nervous derangements; but it is highly important to abstain from all kinds of exertion which over-stimulate the heart. Running, ascending heights, the use of wind instruments, singing or loud speaking, and long-continued standing should be avoided. Moderate and slow walking may be permitted and even encouraged; but passive exercise is decidedly preferable to active; and the patient should ride frequently in a carriage, or upon a very easy and quiet horse. Should the latter mode of exercise, however, be found to excite the heart, it should be abandoned.

Equanimity is highly necessary for the patient, who should, therefore, scrupulously avoid every occasion of mental excitement, and should keep a careful watch and command over his feelings on all occasions.

The plan of treatment above described is adapted to the earlier stages, and to cases in which there are obvious hypertrophic symptoms, with some excitement. It is not absolutely necessary that the pulse should be very full and strong; for, when the right ventricle is hypertrophied, the pulse is not especially affected. But the impulse of the heart should always be strong before the plan is adopted. In weighing the symptoms, should the balance incline somewhat towards dilatation, or waver between the two forms of disease, depletion must be used with more caution, if not omitted altogether. On the contrary, should the action of the heart be very excessive, and symptoms threatening inflammation or hemorrhage in the brain or lungs appear, it may be proper to meet the indication by one or two copious bleedings, and when it has been fulfilled, to resort again to the original plan.

As auxiliary to the above measures, recourse may be had to medicines calculated to diminish the action of the heart. Digitalis may be given in the dose of a grain of the powder, or ten drops of the tincture, twice a day, and very cautiously increased until it is ascertained what quantity is sufficient to affect the system. It should never be carried so far as to sicken the stomach, or produce prostration. American hellebore and hydrocyanic acid have also been recommended; and I have found them serviceable, in some cases, as a substitute for digitalis. I have employed acetate of lead with a view to its sedative as well as astringent action, and have seen the heart apparently diminished in size under its influence; but, in order to do good, it must be continued long, being suspended when it produces any symptoms of gastric or intestinal disorder, and resumed when these have ceased. If used in the incipient stage, it may possibly prove useful in preventing or checking the progress of the disease. I am not aware that I was anticipated by any one in the use of this remedy. I have not seen it do permanent injury; but have always made it a point to watch its action closely. Its careless employment might lead to the production of lead-disease. Dr. Sylvester speaks highly of *Iberis amara*, or *candytuft*, in hypertrophy of the heart. He gives the seeds rubbed to powder with cream of tartar, in the dose of from one to three grains. The remedy was brought into notice by the late Dr. Williams of St. Thomas's Hospital, London. (*Prov. Med. and Surg. Journ.*, Aug. 25, 1847.)

Some good may be expected, when there is pain or much uneasiness about the heart, from permanent external irritation and discharge, maintained by frequently repeated or perpetual blisters, by pustulation with tartar emetic or croton oil, or by an issue or seton. I prefer repeated blistering. This counter-irritation is especially useful in cases of a rheumatic origin or character.

Dilatation.—In this affection, the most prominent indication is to bring about and sustain a proper balance between the quantity of blood, and the power of the heart to circulate it. As the disease very generally depends, in part, at least, upon a want of tone in the muscular tissue of the heart, it is necessary to obviate this condition. The watery or anemic state of the blood, so common in the complaint, is frequently one of the causes of the want of tone alluded to. It also indirectly stimulates the heart to excessive effort, and thus still further tends to exhaust it. Moreover, by the bulk of watery liquid which it contains, it distends the cardiac cavities, and thus directly favours dilatation. Hence, it is of the greatest importance to correct this state of the blood. Our efforts should be directed towards rendering that liquid at once moderate in quantity, and of good quality as regards its nutritive ingredients.

From what has been said, it is obvious that bleeding can very seldom be required. Generally, indeed, it would prove highly pernicious. It will not even diminish the bulk of the blood permanently; for, in the place of that taken, water will be absorbed, and the vessels will soon be filled again. Its real effect upon the blood is still further to impoverish it, and thus secondarily to irritate, while it directly debilitates the heart.

The mild tonics and a nutritious diet are the most efficient means of meeting the indications mentioned. Of the tonics, the chalybeates are the best. They at once strengthen the heart, and improve the blood. They should be continued until the anemic condition, if it exist, shall be corrected. The vegetable bitters may be given as auxiliaries, or as substitutes when the iron has answered the desired purpose. The mineral acids are often excellent adjuvants to the bitters, especially when there is defect of appetite. Small doses of the saline cathartics will sometimes prove useful by diminishing the watery portion of the blood. Animal food should be employed, but with care to select the most digestible and least stimulating varieties. Little drink should be taken, as it tends to make the blood watery. Porter or ale, in moderate quantities, may be allowed when the patient is feeble.

Another important indication is to diminish the frequency of the heart's contractions when it is excited, and to obviate palpitation. This tends to exhaust the heart by over-exertion. The object is in great degree effected by the means calculated to restore the blood to its normal state. But, in addition, it may sometimes be proper to employ sedatives. Digitalis or veratrum viride may be used, but more cautiously than in hypertrophy, as the depressing effects might be carried too far. One of the best remedies to meet this indication is hydrocyanic acid, in the shape of wild-cherry bark tea. This may be given as freely as the stomach of the patient will conveniently bear. Nervous disorder, which is so apt to cause palpitation, should be corrected by the antispasmodics, as assafetida, valerian, camphor-water, Hoffmann's anodyne, aromatic spirit or solution of carbonate of ammonia, &c. Narcotics are also useful for the same purpose. Opiates are the most effectual, and of these the salts of morphia are perhaps on the whole to be preferred. A little camphorated tincture of opium is often very useful. As substitutes or adjuvants of opium, conium, hyoscyamus, and lactucarium may be given internally, and the extract of stramonium or belladonna applied externally in the form of plaster. Opium should not be used, at least in large doses, when the lungs are loaded and the expectoration deficient. Dyspepsia should be guarded against, and corrected if present. Constipation should be obviated by rhubarb and aloes, or other laxatives, when the saline cathartics may be no longer indicated. The stomach should never be overloaded. Moderate passive exercise is not less indicated in this complaint than in hypertrophy; but the patient should guard against all sorts of exertion calculated to bring on palpitations. He should not less carefully guard against mental excitement. Flannel next the skin is necessary to obviate the effects of cold; and frictions to the surface are useful by giving a centrifugal direction to the blood, and thus relieving the heart.

Secondary Affections.—In relation to these, it is not necessary to go into detail. They are to be treated very much in the same manner as similar affections from other causes. When there is great determination of blood to the head, it may become necessary, in addition to general bleeding, to apply cups or leeches to the temples or back of the neck, cold water to the head, and hot stimulating pediluvia to the feet. Pulmonary apoplexy must be encountered with free depletion, when the patient will bear it; and in congestions, inflammations, and hemorrhage of the lungs, the usual remedies must be employed, qualified, however, by the state of the system. In dilatation, the pulmonary affections must be treated much more cautiously by depletion than in hypertrophy. The stimulant expectorants, as seneka, ammoniac, squill, assafetida, and the ethereal and ammoniacal preparations, may be used when there is great debility, with oppressive bronchial secretion. In the paroxysms of dyspnœa, the antispasmodics, narcotics, and stimulating expectorants may be conjoined; and the hot foot-bath, used for a long time, occasionally affords much relief. In vomiting, the aromatic spirit of ammonia is one of the best remedies; but other anti-emetics may be employed if necessary. (See *Vomiting.*) The state of the liver sometimes requires an alterative course of one of the mercurials, with purgatives to relieve congestion. Nitromuriatic acid may sometimes be substituted, both internally and by pediluvium. The treatment of cardiac dropsy is elsewhere considered. It is to be encountered chiefly by diuretics and hydragogue cathartics, of which bitartrate of potassa is the best. When the limbs become enormously swollen, with great oppression in breathing, it is proper to make shallow punctures, with a very sharp lancet, in the legs. These often afford great relief by allowing the escape of serum; though they sometimes occasion inflammation, and give rise to a sort of gangrenous erysipelas, which hastens the fatal issue.

In the *latter stages* of both hypertrophy and dilatation, the efforts of the practitioner should be directed to palliation exclusively. All very active measures should be abandoned, as there is no longer any hope of cure, and the object is to render the patient as comfortable as possible.

In the treatment for the cure, in the earlier stages, the means employed should be persevered in steadily for one, two, or three years. This length of time is usually required for a restoration of the heart to its normal dimensions. Dr. Hope states that the great majority of recoveries, within his experience, take place between one and two years from the beginning of treatment. Even should the symptoms disappear earlier, the remedies should nevertheless be persevered in; nor, indeed, should the patient consider himself free from danger of a return of the malady, nor from the necessity of great caution in the regulation of his habits in all respects, during the remainder of his life.

Article VI.

VARIOUS ORGANIC DISEASES OF THE HEART.

Atrophy.

The heart is sometimes of much less than its average dimensions in health. Thus, it has been found in the adult scarcely larger than that of an infant at birth. The walls are usually quite sound. In some instances, their thickness is not diminished, and the only morbid condition is a reduction of size. Occasionally a wrinkled appearance is presented, as if the organ had shrunk more interiorly than upon the surface. In other instances, again, the walls are attenuated, and this condition is usually accompanied with dilatation. All cases of dilatation in which the mass of the heart is less than in health, may be considered also as cases of atrophy.

There are no symptoms by which this affection can be certainly recognized during life. It may be suspected when the pulse is uniformly threadlike and weak, the impulse of the heart against the ribs scarcely discoverable or quite wanting, the usual dulness on percussion diminished, the sounds very feeble, and no sign observable of other organic affection.

The relative smallness of the heart has been thought to be sometimes congenital, sometimes the result of a sudden arrest of development. It has also been ascribed to continued pressure upon the organ by morbid productions in its neighbourhood, or disease of its pericardial investment. It is said to have resulted from firm adhesion of the opposite surfaces of the pericardium, in the young. But the most common causes are probably those which interfere with the general function of nutrition, and produce emaciation throughout the body; such as severe and long-continued abstinence, and the wasting influence of various chronic complaints. Atrophy of the heart has also been traced to obstruction or obliteration of the coronary arteries.

No treatment addressed especially to the heart will be likely to do good. All that can be expected from remedial measures is the cure or alleviation of the condition of the system upon which the atrophy may depend.

Softening.

Softening of the heart is not uncommon. The form of it which depends on inflammation has already been treated of under carditis. At present our attention will be confined to the affection proceeding from other causes. It may be general or partial; that is, may occupy the whole organ, or may be limited to the walls of one of the cavities, or even to a small spot in the walls.

When the heart generally is involved, it is flaccid or flabby, and, in extreme cases, collapses when emptied or cut into, like a wet bladder. In all cases, the cohesion is more or less diminished. The muscular tissue is easily torn, often admits the finger to be readily passed through it, and is sometimes reducible by pressure to the state of a pulp. Occasionally, as in old age, it is of an almost gelatinous consistence; the fibres being soft, tremulous, and translucent appearance. The colour is various; sometimes very pale, gr or whitish, in other instances yellowish and compared by Laennec to th dead leaves, and in others again deep-red, livid, or violaceous.

Softening is frequently associated with other morbid conditions of the as with obesity, fatty degeneration, and dilatation. The last-mentioned tion is thought very often to result from it.

Symptoms.—The pulse is usually small, feeble, and intermittent, or o wise irregular. The impulse of the heart is feeble, as are also the so especially the first, which is sometimes wanting. It is probably owing t attendant softness, that, in great dilatation, the heart, instead of yieldin loud sound which ordinarily accompanies that affection, can in some inst scarcely be heard. A disposition to syncope, and all the other consequ of an insufficient supply of arterial blood, and of venous congestion i lungs and elsewhere, which have been enumerated under the heading o pertrophy and dilatation, are experienced in softness of the heart. The owing to the feebleness of the cardiac contractions, which fail to send the forward sufficiently, and consequently permit its accumulation poster When these symptoms are offered in any case, without valvular murmurs latation, and without any reason for ascribing them to nervous disorder may be considered as indicative of softening of the heart.

Causes.—Whenever, along with the softening, there is pus in the mu tissue, or ulceration or inflammation of the investing or lining membra may be considered as of an inflammatory character; and the same is pro the case with most of the partial softenings. In other instances, the aff depends either on defective nutrition from poverty of the blood or gener bility, as in anæmia, wasting chronic complaints, old age, and the prostr which follows acute diseases; upon a depraved condition of the blood, malignant fevers and scurvy; or, finally, upon continued venous congesti the substance of the heart, as in certain valvular diseases of that organ in dilatation. It may also depend upon obstruction, or other morbid of the coronary vessels. When caused by anemic conditions of the sy or mere chronic debility, the softening is usually pale or yellowish. A tendant upon typhous or scorbutic disorder, it is often dark-red or livid is occasionally accompanied with extravasation of dark blood, either upo surface of the heart, or in disseminated spots through its muscular subst It is frequently associated with fatty degeneration. The late Dr. Wm. Pe of Philadelphia, found softening of the heart to accompany that sudden tration of system which follows excessive fatigue, with exposure to a ho and which, under the name of *sun-stroke*, is sometimes confounded with congestion of the brain.

Effects.—Softening may prove fatal by rupture, dilatation, or syncope sequent upon the direct loss by the heart of its power of contracting. not unfrequently remediable, though it adds greatly to the danger of the plaints with which it is associated, and is probably one of the direct c of fatal prostration in malignant fevers.

Treatment.—This must be addressed to the state of the system. In ch and anemic affections, the chalybeates are most to be relied on, aided sionally by the simple bitters or quinia. The mineral acids are also u but must be employed cautiously with the preparations of iron, because times chemically incompatible with them. They may often be advantage associated with tincture of chloride of iron. When the debility is very it may be necessary to resort to the more powerful stimulants, as carb of ammonia, oil of turpentine, wine, and even brandy. The diet should a be in the highest degree nutritious and digestible.

Induration.

The muscular tissue of the heart sometimes becomes simply hardened, without undergoing any other appreciable change. Corvisart described a case in which the organ gave, when struck, a sound similar to that of a dice-box, and produced a crepitant sound when cut. Cases similar in relation to the sound were noticed by Laennec and Hope; and Broussais mentioned instances, within his own observation, in which the heart resembled a cocoa-nut in hardness. One would suppose that the power of contraction must be lost under such circumstances; but this does not appear to be the case. The affection is extremely rare. It is of unknown origin, though referred by some to inflammation.

Degeneration and Abnormal Products.

Under this head are included all the affections in which the tissues of the heart undergo changes so as to lose entirely their original character, or in which morbid products, whether the result of growth or mere deposition, encroach upon its substance. These are numerous, but all of them rare.

1. *Fibrous, cartilaginous,* and *osseous degeneration* have before been treated of as occurring in the lining or investing membrane, or in the areolar tissue intervening between these and the muscular structure, or in the valves. (See *Pericarditis, Endocarditis,* and *Valvular Disease.*) The same degeneration has been observed, in some rare instances, in the muscular tissue. It is probable, however, that, in these cases, the fibre has rather undergone absorption in consequence of the pressure of the newly deposited matter, than been the subject of transformation. Sometimes isolated calculous masses have been found embedded in the thickness of the cardiac walls. Ossification of the coronary artery is not a very rare occurrence in persons advanced in life. It does not necessarily give rise to observable morbid effects; though angina pectoris has been ascribed to it.

2. *Fatty degeneration* has been noticed by various pathologists, and has been ascertained to be a more common affection than was at first supposed. The muscle undergoes a partial change into fatty matter; and oil globules may be seen, by the aid of the microscope, occupying the place of the proper muscular fibre, within its sarcolemma. The heart, or the portion of it affected, is pale, yellowish, or of a dirty-pink colour; and this discoloration is often in patches, giving the organ a mottled appearance. Sometimes the altered colour is confined to one portion of the heart. Softening to a greater or less extent is always present, sometimes having the character of flabbiness, sometimes of friability. The natural fibrous appearance gives place to a uniform or granular aspect of the cut surface. In advanced cases the fat is so copious as to be obvious to the eye, and to give a greasy feeling to the texture. The chief seats of the degeneration are said to be the inner portion of the walls of the heart, and the fleshy columns.

This affection is dependent on diminished vital force in the heart, allowing chemical influences to supersede the proper nutritive function, and may be connected either with general debility, or with local impediment to the due nourishment of the organ, as from disease or obstruction of the coronary arteries. Among the sources of this obstruction in the coronary arteries, attention has been called by Dr. Hodgkin to the narrowing or closure of these vessels, at their origin, by the contraction of plastic deposit in their coats, resulting from endocardial inflammation. (*Med. T. and Gaz.*, April and June, 1856.) It is most apt to occur in old age, and is favoured by inaction and intemperance. It is not unfrequently observed in hypertrophied hearts. The affections with which it is most frequently associated are phthisis, chronic gout, chronic dis-of an almost gelatinous consistence; the fibres being soft, tremulous, and of a translucent appearance. The colour is various; sometimes very pale, grayish, or whitish, in other instances yellowish and compared by Laennec to that of dead leaves, and in others again deep-red, livid, or violaceous.

Softening is frequently associated with other morbid conditions of the heart, as with obesity, fatty degeneration, and dilatation. The last-mentioned affection is thought very often to result from it.

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The affection is incurable. Patients may live long with it, but are apt to die suddenly upon the occurrence of other diseases, of surgical operations, or of any accident that may interfere with the heart's action. It is in this affection, too, that rupture of the heart is most apt to take place. Though it is impossible to restore the muscular fibre which has undergone the fatty degeneration to its normal state, yet it is probable that much may be done by correcting the state of system, to retard if not check its progress. This must be effected by the usual methods, care being taken to avoid everything calculated to overtask the heart, lest it may suddenly fail to perform its duty. For a full account of the disease, the reader is referred to a paper by Dr. Richard Quain, in the *London Medico-chirurgical Transactions* (xxxiii. 121). The presumed or probable existence of fatty degeneration of the heart should always be considered as contraindicating the inhalation of chloroform.

3. *Obesity* of the heart is not very unfrequent. The fat is deposited between the pericardium and muscular substance, and sometimes penetrates between the fibres of the latter. Occasionally it accumulates in enormous quantities, so as completely to conceal the muscular structure, and materially to interfere with the heart's motion; and has been thought in some instances to have caused death. The muscular layers beneath it sometimes become softened and attenuated, probably from absorption produced by pressure. The affection is most frequent in very fat individuals, though it has sometimes been noticed in connection with great general emaciation.

The symptoms are not usually striking. Sometimes no morbid phenomena are observed, and the existence of cardiac derangement is first discovered after death. In other cases, the patient suffers with dyspnœa, palpitation, and other ordinary signs of embarrassed action of the heart. In the cases in which the fibres undergo atrophy, there are weakness and irregularity of pulse, with feeble impulse and diminished sound. When these symptoms occur in very fat persons, with no other discoverable cardiac disease, they may be conjecturally referred to obesity. They have been observed to increase and diminish with an increase and diminution of the general fatness; and a case is mentioned by Chomel, in which violent symptoms of derangement of heart, occurring in an obese individual whose case presented the phenomena just alluded to, yielded to abstinence and depletion.

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* I have recently had an opportunity of confirming this coincidence of the two affections. An old seaman, entering the Pennsylvania Hospital, was observed to have the arcus senilis. The impulse and sounds of his heart were very feeble. Fatty degeneration of the heart was diagnosticated. He died suddenly, and the diagnosis was fully confirmed on post-mortem examination (*Note to the fourth edition.*)

It will have been noticed that this is a very different affection from fatty degeneration, which has nevertheless been sometimes confounded with it. The latter is a degenerative conversion of the muscular tissue into fat; the former is merely an excessive production of fat, which, if it ever injuriously affects the muscle, does so simply by pressure, thereby causing its partial absorption. It is, however, possible that the two affections may in some instances exist conjointly, though, even in such a case, without any mutual dependence.

The treatment in this affection must be directed to the fatness in general, and should consist chiefly of a spare diet without fats, such depletion as the system can well support, exercise of the passive character, and the use of the vegetable acids as freely as can be borne without impairing digestion.

4. *Tubercles* have been found in the heart, but are very rare. The same is the case with *cancerous disease*, whether in the form of *scirrhus* or *medullary fungus*. These affections scarcely ever seize upon the heart, unless previously existing in other parts of the system. It is said that scirrhus has sometimes occasioned acute lancinating pains; and the cachectic sallowness usually characteristic of cancer may be supposed to attend it. A certain diagnosis, however, in these cases, is quite impossible. Nevertheless, should there be an evident cancerous cachexia, and carcinomatous formations be known to exist elsewhere, any obscure disease of the heart may with great probability of correctness be referred to this disease. *Cysts and hydatids* have been discovered in the heart upon dissection; but there are no signs by which they could be recognized during life.

Rupture of the Heart.

Rupture of the heart, in a healthy state of the organ, may happen from mechanical violence, as a heavy blow, a crushing fall, or the pressure of some great weight, as of a wagon-wheel upon the chest; and, proceeding from such causes, is said to be more common on the right than the left side. It may also happen from disease, and in this case is most common on the left side. Fatty degeneration of the heart is probably the most frequent cause of rupture. Extreme dilatation may have the result; and this is one of the fatal terminations of partial dilatation, or proper aneurism of the heart. The accident is not relatively unfrequent in hypertrophy. In that affection the parietes are very often unequally thickened; and, as the ventricle contracts with much more than the usual force, it might be expected that the thinnest portion would give way. Now, as the ventricle is thinnest at the apex, it would seem to be a fair inference, that the rupture must take place more frequently at or near that point than any other. The fact is, that it does occasionally take place there; but it is asserted that a more frequent seat of the accident is in the thickest part of the heart, towards the base of the ventricle. The only explanation of which this fact appears to be susceptible is, that, in hypertrophy of the muscular substance, the fibres lose their cohesiveness in a greater degree than their force of contraction; and that a rupture takes place, as in the gastrocnemius, from a sudden and violent action of that muscle. Whether the heart has been hypertrophied or dilated, contraction of some one of the orifices has been noticed in a large proportion of the cases of rupture. It is obvious that, in the different organic changes to which the walls of the heart are liable, a degree of brittleness may sometimes result, which may predispose to rupture under an excited action of the organ; and hypertrophy of the heart has been ascertained to be not unfrequently associated with fatty degeneration. Ulceration and abscess of the heart have sometimes been the cause of the accident, by reducing the walls to a thinness unequal to the necessary resistance against the pressure to which they are exposed. The effusion of blood into the substance of the heart is also ranked among the disposing causes. Whatever may be the morbid state of the heart disposing to the rupture, it is apt to be caused immediately by an unusual degree of action or distension in the organ, proceeding from unusual muscular exertion, paroxysms of anger, violent coughing or vomiting, or some other source of excitement. It is said to occur more frequently in men than in women, and in old persons than in the young.

The rupture is sometimes large and completed at once, sometimes small at first, and gradually extended. Cases are on record in which two or more openings existed in the same heart. The rupture is occasionally partial, not entirely penetrating the walls. Sometimes only the fleshy columns or chordæ tendineæ are broken. The accident is much more frequent in the left than in the right ventricle, and more so in the right ventricle than in either of the auricles. In cases, however, of rupture from violence, the right cavities are most apt to be affected, because more exposed by situation, and less able to resist from their thinner walls. Some rare instances are on record in which the coronary artery has been ruptured, filling the pericardium with blood. (*Archives Générales*, 4e *sér.*, xiv. 195.)

The antecedent symptoms vary, of course, according to the cardiac affection which gives rise to the rupture. Sometimes none are observed, unless perhaps slight dyspnœa. Instances have occurred in which the rupture was preceded for a short time by excruciating pain, remittent or continuous, shooting from the præcordia to the back, and into the left shoulder and arm. This pain has been ascribed to the gradual rending of the muscular fibres.

In the great majority of cases, the consequence of rupture of the heart, and effusion of blood into the pericardium, is almost instant death. The patient suddenly becomes excessively pale, speedily loses consciousness, and dies of syncope. This, however, is not always the case. Instances occur in which life continues several hours, and even for a considerable period. When the opening is very small, death may be long protracted; and there is reason to suppose that a spontaneous cure is not impossible. A case is on record, in which, after death from rupture, the remains of a former rupture were observed, in which the vacuity was filled up with a fibrinous concretion adhering to the walls of the heart.

There are no symptoms by which a partial rupture of the walls can be recognized. When the fleshy columns or tendinous cords are torn, the loose ends of the columns, or the liberated laminæ of the valves, float into and out of the orifices with the current of blood, and occasion much embarrassment of the circulation, both from obstruction and insufficient closure of the valves. There is usually violent pain, with sudden and great oppression amounting almost to suffocation, and much disturbance in the actions of the heart. The most confused sounds are heard in the chest, and among them not unfrequently the murmurs of constriction and regurgitation. A tremulous uncertain pulsation of the heart may be felt by the hand in the cardiac region. Should the patient survive long, hypertrophy or dilatation is likely to ensue.

Little need be said in relation to the treatment of rupture of the heart.
ly death has taken place before the physician arrives. Should the case
hat protracted, the indications are to keep the patient perfectly at

rest, and to quiet any irritation of system by anodynes. The great point to be aimed at is, that the heart should act as little as possible compatible with the maintenance of life.

Fibrinous Coagula.—Polypous Concretions.

Two kinds of fibrinous concretion are found in the cavities of the heart; one formed either after death or at the moment of dissolution, the other some time before death.

The former are wholly unorganized, and consist of coagulated fibrin, which has separated from the mass of blood, as the buffy coat separates in inflammatory blood removed from the body. They are whitish or yellowish-white, translucent, sometimes of a tremulous jelly-like consistence, sometimes firmer, occasionally with a darker nucleus in the centre, and but slightly adhering to the surface of the cavity, from which they can be readily separated without altering the structure of the endocardium. They are usually found in the right cavities, and result from an excess of fibrin, or a high degree of coagulability of that principle, which is brought into action by the stasis of blood.

The second variety of concretions, which better deserve the name of *polypous* that has been applied to both, are real morbid products, and give rise during life to very serious symptoms. These are firmer than the preceding, more opaque, of a fibrous texture, and sometimes composed of successive layers. In size they are extremely diversified, in some instances being very minute, in others almost filling one or more of the cavities of the heart, and of all intervening dimensions. Their colour is usually white, but occasionally reddish from the presence of blood, which has been thought to be contained in rudimentary vessels that ramify in the mass, and constitute the commencement of an imperfect organization. They adhere firmly to the surface of the endocardium, so that, when separated, they leave an appearance as if torn off; and sometimes a vascular communication seems to exist between them and the substance of the heart. Different opinions have been entertained as to their mode of formation, some ascribing them to the coagulation of a portion of the blood, which afterwards contracts adhesion with the heart, others considering them as the product of fibrinous exudation from the inner cardiac surface in a state of inflammation. They are probably produced sometimes in the one way, and sometimes in the other. When the blood contains an excess of fibrin, and is from any cause delayed in the heart, it may readily be conceived capable of forming coagula, and especially when a small portion of concrete exuded fibrin is present to serve as a nucleus. In like manner, it is altogether probable that the inflamed endocardium, like other serous membranes, sometimes throws out coagulable lymph in sufficient quantity to form concrete masses of considerable magnitude. To the former origin may be referred the globular vegetations of Laennec, which vary in size from the magnitude of a pea to that of a pigeon's egg, sometimes adhere to the surface by a pedicle more recent than themselves, and contain within a central cavity a bloody or pus-like fluid.* To the latter probably belong the warty vegetations, which have been before mentioned as occasionally forming upon the valves and in their neighbourhood. These concretions may always be distinguished from the unorganized variety, according to the observations of M. Friedault, by containing proper pseudomembranous matter, in which primarily cells are observable by aid of the microscope, and afterward fibres formed from them. (*Arch. Gén.*, 4e *sér.*, xiv. 63.)

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* It is now understood, through the researches of Mr. Gulliver, that this pus-like product, in the centre of fibrinous coagula, is in reality not identical with pus; being the product not of inflammation, but of degradation of the fibrin itself. Yet the two conditions are not without analogy. If pus is, as considered probable in this work, a degradation or fatty degeneration of the coagulable lymph exuded in inflammation, the exudation-corpuscles becoming pus-corpuscles on losing their vitality, then the corpuscles formed by fibrin in coagulation, upon undergoing degeneration, might bear no little resemblance to pus-corpuscles, though resulting from a different process. (*Note to the sixth edition.*)

But, however formed, these concretions prove sources of great inconvenience, and often of danger. They diminish the cavity in which they are placed, and, by narrowing the orifices through which the blood passes, or preventing a proper coaptation of the valves, may produce all the effects of the most serious valvular disease. Their symptoms are uncertain. They may be suspected, however, when the movements of the heart, previously regular, become suddenly much embarrassed, with irregular and confused pulsations, great dyspnœa, and the general signs of a diminished supply of arterial blood on the one hand, and of venous congestion on the other. Among the most frequent symptoms are great prostration, a feeble irregular pulse, coldness of the surface, paleness of face, extreme anxiety, and the utmost difficulty in respiration, with a sense of suffocation and inability to lie down in bed. Nausea and vomiting have been noticed as attendants on the affection. (Basking, *Am. Journ. of Med. Sci.*, N. S., xx. 404.) The symptoms, in some instances, cease for a time, and again return, probably in consequence of the newly formed mass being at one time carried within reach of the valves so as to derange their functions, and then floating away for a time so as to leave them free. This may easily happen when they are attached by a pedicle which allows them free motion in the cavity. But the diagnosis is always uncertain.

It has been recommended, in order to prevent the formation of these concretions, to bleed very freely in cases of endocardial inflammation, or others in which a tendency to their production may be supposed to exist. But to push depletion, from fear of cardiac concretions, beyond the point required upon other grounds, would be to run the hazard of very serious evils, to avoid one which may be altogether imaginary. They may, therefore, very properly be left out of view, unless as an additional inducement to the cure of all inflammatory diseases by means adapted to the obvious circumstances of each case. When already formed, they are generally beyond the reach of remedies; though, in recent cases, it may not be amiss to employ alkaline medicines, in the hope that their solvent influence over fibrin may have some effect in promoting the solution of the exuded or concreted matter.

Malformation of the Heart.

A great variety of congenital malformations of the heart are recorded. Most of them, however, have little interest for the practitioner. I shall notice them here only in connection with a certain state of the circulation, which, being marked to common observation chiefly by the discoloration of skin that attends it, has from this cause received the name of the *blue disease*.

Cyanosis.—*Morbus Cæruleus.*—*Blue Disease.*—The colour of the skin in this affection is bluish, purplish, or livid, but varies very much in degree in different cases, and even in the same case, being sometimes slightly livid, sometimes so dark as to approach to blackness. In very mild cases, it is perceived chiefly in the lips, mucous membrane of the mouth, ends of the fingers, &c., where the capillaries are most numerous, or nearest the surface. In some instances, it is almost or quite wanting at one time, and present in a high degree at another. The intensity of the colour is very generally increased by whatever increases the action of the heart. Along with the discoloration is usually an unnatural coolness of the surface; and the patient is either habitually subject to dyspnœa and palpitation, or is frequently attacked by them. Other attendant symptoms are an irregular and intermittent pulse, occasional fainting, in some cases convulsions, and, if the complaint continue long, more or less dropsical effusion. The patients are generally subject to violent suffocative paroxysms, in which the palpitations and dyspnœa are excessive, and the skin assumes its deepest hue. Such attacks are induced by unusual muscular effort, mental emotion, or whatever else unduly excites the heart. They are very apt to end in syncope; and it is generally in one of these paroxysms that the patient expires.

Cyanosis is most frequently congenital. Of 71 cases collated by Dr. Moreton Stillé, it existed at birth in 40. (*Am. Journ. of Med. Sci.*, N. S., viii. 42.) When not congenital, it usually makes its appearance first in early childhood, though sometimes in adult age. It is often quickly fatal, but may run on for many years, and sometimes from birth even to middle or advanced life. Of the 40 congenital cases above alluded to, 17 died within a year, 10 between one and ten years, 10 between ten and twenty years, and 3 only survived the last-mentioned period, of whom one attained the age of 57. The disease is rather more frequent in males than in females.

Bluish or purple discoloration of skin may arise from different causes. Stagnation of the blood in the capillaries from debility of these vessels, general venous congestion from obstruction in the heart, lungs, or pulmonary vessels, and deficient aeration of the blood from any cause which permits a continuance of the circulation, may produce it. But, in that intense degree, and with those associated symptoms, which are necessary to constitute a case of cyanosis, as generally recognized, the affection depends exclusively upon organic disease of the heart or large vessels; and in that light only it is viewed here. There is not, however, even in regard to the disease thus restricted, a coincidence of opinion as to the precise cause of the discoloration.

Two different views are entertained, one ascribing the colour to an intermixture of the venous and arterial blood, and the other to general venous congestion consequent upon obstruction at the heart. But neither of these seems to me to be quite satisfactory.

The opinion which ascribes the result exclusively to an intermixture of the two kinds of blood, supposes that nothing more is necessary to its production than such a direct communication between the two sides of the heart, or between the cardiac receptacle of venous blood and the arteries which supply the system, as to render some mixture necessary. Now cases have been adduced in which such a communication has beyond all doubt existed, and the arterial and venous blood have necessarily flowed together, intimately united, throughout the body, and yet no cyanosis has resulted. Nor does it seem that it ought to be an essential physiological consequence of such a mixture. The colour of the surface in health is not owing to arterial blood alone. The venous and arterial capillaries ramify everywhere together, and the colour no doubt depends upon both, and may be considered as intermediate between the two. The effect, therefore, is the same as though the two kinds of blood were flowing together through the same vessels, mingled in the same proportion. It follows that their mere intermixture, instead of producing cyanosis, may give rise to the ordinary healthy hue of the skin, provided the change in the capillaries be diminished in the proportion of the amount of venous blood added to the arterial; and this may be readily conceived to be possible.

Against the second opinion also, though plausible, there seem to be strong objections. If a mere impediment to the circulation existing in the heart or its great vessels, even a very considerable impediment, were sufficient alone to produce cyanosis, we ought to have it as a very frequent disease; for such impediments in the heart are of constant occurrence, often in such a degree as to prove fatal. But cyanosis is very rare, and especially in old age, when such cardiac obstructions are most common. It is true that a certain amount of discoloration is produced by this cause, especially in the lips and extremities; but no one thinks of ranking the cases in which it occurs with cyanosis. Indeed, it is impossible that an amount of venous congestion throughout the system, capable of producing this change of colour, could remain long without calling into operation the obviating powers of the system. The excess is thrown off in the form of dropsical effusion, hemorrhage, &c., and the inequality is thus to a certain extent relieved.

What then is the true explanation of the change of colour? To answer the question correctly, we must understand what is the character of the lesions with which the disease is connected. These may be included under two heads; *first*, those which establish a direct communication between the venous and arterial circulation; *secondly*, those which obstruct the access of blood to the lungs, or, by producing congestion in that organ, interfere with the due aeration of the blood. Under the first head may be ranked a want of closure in the foramen ovale, a preternatural opening between the two ventricles, perviousness of the ductus arteriosus, the existence of but one ventricle, and a false position of the great vessels, as, for example, of the aorta arising from both ventricles or from the right exclusively, or forming a common trunk with the pulmonary artery. Of these, the open or enlarged foramen ovale is, according to Gintrac, the most common, being found in 33 out of 53 cases. Sometimes it is so much enlarged as to admit the thumb. It is obvious that, in consequence of any one of these lesions, the venous blood may find entrance into the aorta, and circulate along with the arterial blood. Of the second set of lesions alluded to, the most frequent and important is partial or complete obstruction, or obliteration of the pulmonary artery. Of the 53 cases collected by Gintrac, this artery was contracted or obliterated in 27; and it may have been so in others, in which its condition appears not to have been stated. According to Dr. Stillé, in whose valuable paper, before referred to, much statistical information is collected and collated, of 62 cases in which the state of the pulmonary artery was observed, it was either "contracted, obliterated, or impervious" in 53. This, then, may be considered as one of the most common lesions in cyanosis. Others having precisely the same effect, namely, to impede the access of blood to the lungs, are a contracted state of the right ventricle, and diminution of the right auriculo-ventricular orifice. Others, again, which may act by producing congestion of the lungs, and diminishing the amount of aerated blood, are contraction of the left ventricle or of the aorta near its origin, and diminution of the left auriculo-ventricular opening.*

It appears, therefore, that in almost all cases of cyanosis there is the coexistence of a preternatural communication between the arterial and venous circulation, with impediment to the access of blood to the lungs, or imperfect aeration of that which reaches them. Among all the cases collated by Dr. Stillé there are only 5 exceptions to the former branch of this statement, and in two of these the cyanosis was partial. To the latter branch of the statement there is scarcely a single well-authenticated exception. This may be considered as a virtual establishment of the rule; as the very small number of exceptions may be readily referred to imperfect or mistaken observation, or to a latitude in the application of the name of the disease; a certain amount of blueness of the skin being occasionally found wholly unconnected with organic lesions of the heart.

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* An ingenious explanation has been given, by M. Cl. Bernard, of the comparative frequency of congenital lesions of the pulmonary artery and the right side of the heart. After birth, the main duty of the circulation falls upon the left side of the heart, and, as parts are liable to disease in proportion to their normal activity, this side is much more frequently affected with inflammation and other organic disorder, the right side being rarely the seat of primary lesions. In the fœtus it is otherwise; the office of circulation being performed mainly by the right side, and especially by the pulmonary artery, which thus becomes specially liable to disease. (*Arch. Gén.*, Août, 1856, p. 161.)

These data being admitted, it is not difficult to explain the occurrence of cyanosis. A mere communication between the two cavities, even allowing that a considerable mixture of the venous and arterial blood may occur, which does not by any means necessarily follow, is insufficient to account for the phenomenon; as such a mixture may not produce a different colour from the natural, unless the quantity of venous blood be very large. Hence, in cases in which such a communication exists, with a free access of blood to the lungs, and a free aeration of it there, cyanosis is not produced. But let the entrance of the blood into the lungs be impeded, as in obstruction of the pulmonary artery, or let aeration take place imperfectly, as in pulmonary congestion from various organic cardiac lesions, then, the proportion of arterialized or aerated blood being lessened, if the two kinds are mingled together, the venous must predominate; and everywhere in the capillaries of the body will circulate a blood darker than the mean of the two kinds, which exist in the interlacing venous and arterial capillaries in health, and upon which the natural colour of the surface depends. Hence the skin must be darkened; and the intensity of the discoloration must be inversely proportionate to the amount of venous blood arterialized in the lungs, and directly to the degree in which the blood from the venous side of the circulation is mingled with the arterial.

Much importance has been attached to the patency of the foramen ovale, much more, indeed, than it deserves. While the actions of the heart are properly balanced, this is of little consequence. The venous and arterial blood might mingle slightly; but not to any considerable extent. The two auricles being filled at the same moment, and contracting together, balance each other, and each sends the blood into its corresponding ventricle. Any inferiority of power on the part of one of the auricles would speedily be corrected by an increase of growth, resulting from the stimulus of the increased pressure. It is only when connected with other lesions that this becomes important. Contraction of the pulmonary artery, by causing accumulation in the right ventricle and auricle, must send a current through the foramen into the left side of the heart. Thus, the same cause which prevents aeration of a portion of the blood by preventing its access to the lungs, occasions its mixture with the portion already aerated. The opening of the foramen is probably produced or maintained in general by the accumulation of blood, and consequent excess of pressure in the right auricle; and may be considered as a provision of nature for partially remedying a greater evil, and thus prolonging life.

That discoloration of skin which occasionally takes place in new-born infants, and speedily yields to the ordinary influences, is probably owing in general to a yet imperfect permeability of the lungs, and the consequent circulation of a non-aerated blood; the foramen ovale being still open.

The treatment of cyanosis must be merely palliative. Life may be prolonged, and the comfort of the patient promoted by a strict observance of those rules calculated to maintain the circulation in a moderate and equable condition. Tranquillity of the body and mind is of the highest importance; and scarcely less so, a proper regulation of the diet, which should be moderately nutritious, without being in the least stimulating. Animal food should be used sparingly. The digestion should be attended to, and nervous disorder quieted, if necessary, by the occasional use of narcotics and antispasmodics. Passive exercise is highly useful.

It would be improper to omit here the notice of a remedial measure, in the blueness of new-born infants, which comes recommended by the great experience of Dr. C. D. Meigs, formerly Professor of Midwifery in the Jefferson College of Philadelphia. His plan is to lay the infant "on its right side, with its head and shoulders inclined upwards on pillows," and to keep it "for several hours in that position." Dr. Meigs has succeeded by this treatment "in rescuing from impending death upwards of 20 persons." (*Proceedings of Amer. Phil. Soc.*, iii. 174–5.) Though we may not admit the theory, which attributes the success of this measure to the effect of gravitation in keeping the foramen ovale closed, we have no right on that account to reject it as a therapeutical measure, sanctioned by so high an authority.

Article VII.

FUNCTIONAL OR NERVOUS DISEASES OF THE HEART.

THESE are, on several accounts, highly deserving of the notice of the physician. They are very frequent, are in themselves often the source of much inconvenience, distress, and even danger, and occasionally terminate, when of long duration, in fatal organic affections of the heart. Besides, imitating, as they often do very closely, these affections, they are apt to occasion much anxious apprehension on the part of the patient, lest he may be labouring under incurable disease. In order, therefore, to be able to give all proper consolatory assurances, and with the view also of obtaining just indications of treatment, which often differ greatly in the two orders of disease, it is very important to form a correct diagnosis. This is not difficult in decided cases; but there are some in which a sure decision is almost impossible, and the greatest skill must be satisfied with probable conjecture. When, for example, an organic affection is in that stage of advancement in which it exhibits signs only during an excited state of the heart, and when these signs coincide exactly with those which are sometimes offered by mere functional disorder, we must be content with a very doubtful appeal to the existing or preliminary state of system, the probable causes, and other circumstances of an equally uncertain character. In those cases, moreover, in which the functional is just passing into the organic, it is not possible always to determine the boundary; and when, as occasionally happens, the two are combined in the same case, without any necessary mutual dependence, as when rheumatic or gouty neuralgia supervenes upon a structural lesion, an accurate discrimination is not always within our reach. The best plan of diagnosis is, probably, first, to determine what circumstances are incompatible with the idea of mere functional disorder, and secondly, what are compatible only with that idea. We shall thus, at least, separate the certain from the doubtful; and it will be found, in practice, that only a comparatively small number of cases will be left undecided.

1. In nervous or purely functional diseases, the characteristic symptoms are scarcely ever, perhaps never, constant during a great length of time. In the organic, though there are some cases in which the signs are not always obvious, and many in which they are much more obvious at one time than another, yet in the great majority, as the lesion is invariably present, so also are its evidences, which may be discovered if carefully sought for. When, therefore, the signs of cardiac disorder are discoverable at all times, and under all circumstances, by night and by day, in sleeping and waking, during rest and exertion, not only for days, but for weeks, months, or years, the inference is unavoidable that they are something more than functional.

In cases attended with continued or permanent secondary affections, resulting from the strong sanguineous determination and venous congestion of cardiac disease, such as bloated features, purple lips, bleedings from the nose, apoplexy, pulmonary hemorrhage and œdema, general dropsy, &c., the probabilities are altogether in favour of the existence of organic derangement. Of course, this rule does not hold, when the affections alluded to are mere accompaniments of the cardiac disease and not effects of it.

Again, the same conclusion is justifiable, when the existence of preternatural dulness on percussion in the precordial region, not traceable to disease of the neighbouring parts, indicates enlargement of the heart, or distension of the pericardium. So also, according to general belief, when a morbid state of the second sound of the heart exists, evincing regurgitation through the semilunar valves, which, it has been supposed, can scarcely happen from mere disordered action in the organ.* The case, however, is different in regard to the auriculo-ventricular valves, regurgitation through which has been observed without organic lesion, probably dependent on spasm, temporary paralysis, or great weakness, of one or more of the fleshy columns, connected with the valves through the tendinous cords. A strong murmur, traceable far up the large vessels, may be considered as indicative of organic disease.

2. When the symptoms of cardiac disease are ameliorated by vigorous exercise, as not unfrequently happens, we may be very certain that the complaint is not organic. It does not follow that every case of functional derangement is directly relieved by this means. On the contrary, when such derangement accompanies anæmia, it is often greatly aggravated by bodily motion. We only infer that it must be functional, whenever it is susceptible of permanent alleviation in this way. Moreover, when the cardiac symptoms can be traced to some particular cause, appearing when that is in action, and disappearing when it ceases to act; as, for example, when they accompany the abuse of narcotic or stimulating substances, and vanish when these are used no longer, they must be considered as strictly functional.

Cases which do not fall into one of the above categories, must be judged of according to the weight of probabilities. The conditions which should incline the scale towards organic disease have been mentioned under the individual complaints belonging to that division. Those of a contrary tendency will be alluded to under the following heads.

Functional disease of the heart may evince itself by alt[illegible]n, either in the movements or the sensations of the organ, and in either case may have the character of irritation or of depression. Deranged movement may be included under the two divisions of *palpitation* in which the heart is under excitement or irritation, and *syncope* in which it acts feebly or ceases to act. *Neuralgia* of the heart, or angina pectoris, includes all the cases of mere functional affection of a painful character; and this may be associated with elevation or depression of the vital power of the organ.

I. PALPITATION.

This term is used to signify inordinate pulsations of the heart, sensible to the patient himself, or readily perceived by the observer. Such pulsations are often excited, in a perfectly healthy individual, by incidents and emotions which come within the limits of ordinary life. Under these circumstances, they can scarcely be considered as morbid. Palpitation is a disease only when so frequent, or so readily excited, as to become a source of inconvenience or apprehension. It must be recollected that, in this place, we are considering it only as a functional disorder, and not in its connection with organic disease of the heart, of which it is one of the most common attendants.

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* If it be true, as maintained by some, that muscular fibres exist in the semilunar valves, controlling their movements, then regurgitant aortic and pulmonary murmurs may possibly be merely functional, and their presence less positively indicative than has been supposed of the existence of organic disease of the heart. (See *Lond. Med. Gaz.*, March, 1850, p. 408.) Skoda states that he has occasionally heard a double second sound without any organic disease of the heart or its valves. This may be explained upon the supposition of a want of perfect synchronism in the action of the ventricles, which may depend on nervous disorder. (*Note to the fifth edition.*)

It is asserted that a double intermittent murmur in the crural artery, heard under slight pressure, which is a uniform attendant on aortic regurgitation, not unfrequently occurs temporarily in typhoid fever, chlorosis, blood-poisoning, &c., showing that the semilunar valves sometimes fail to perform their duty, under influences that derange the nervous functions, without organic change; and, if this be true, there is no reason why the murmur of aortic regurgitation may not also be heard at the heart under similar circumstances. (*Arch. Gén.*, Mai, 1861, p. 605.)—*Note to the sixth edition.*

Symptoms.—Palpitation varies, in degree, from a scarcely perceptible movement to one so tumultuous and violent that it visibly agitates the whole chest, and occasions great distress. The pulsations may be increased in frequency, or in force, or both. They are sometimes regular, but more frequently irregular, intermittent, and fluttering; and the pulse partakes of the same qualities. The latter is in some instances small and feeble, in others fuller and stronger; but generally it is characterized rather by a quick, jerking, irritated motion than by strength. The impulse of the heart may be felt much more widely than in health, sometimes over a great portion of the left side of the chest, and even on the right side. The sounds too are much louder. Occasionally they are heard distinctly by the patient himself, especially when lying on his left side, and even by a bystander at the distance of some feet. The patient is sensible of a whizzing, rushing noise, which seems to ascend up the neck; and sometimes he hears both of the cardiac sounds. When the palpitations are violent, a metallic ringing sound is often heard in auscultation, which has been ascribed to the impulse of the heart against the chest, but has seemed to me to proceed from a deeper source. Not unfrequently a bellows murmur attends the first sound; but is confined to this, and is said by Dr. Hope to be limited to the aortic valves; although it has been observed by others over the mitral valves. Often also the murmur characteristic of anæmia is heard in the jugular veins, and slight bellows murmurs are emitted by the large arteries when compressed.

The attack often comes on under some mental or physical excitement; but often also when the patient is at rest, and not unfrequently in the night, awakening him perhaps from his first sleep. When violent, it may occasion much distress. The heart feels as if bounding upward into the throat; a sense of anxiety or oppression is experienced in the precordial region, with hurried respiration or dyspnœa, so that the patient is frequently unable to lie down; ringing in the ears, and vertiginous sensations often occur; and occasionally faintness and even syncope. The duration of a paroxysm is quite uncertain, sometimes not exceeding a few minutes, sometimes lasting for days without absolute intermission, though varying much in violence during that time. Most commonly it terminates within thirty minutes or an hour, recurring afterward quite irregularly, sometimes daily or several times a day, and sometimes not until after a long interval.

Causes.—Strictly speaking, palpitation is rather the result of disease than a disease itself; and the real morbid condition upon which it depends, leaving organic affections out of view, is either deranged innervation of the heart, or an unhealthy state of the blood, which may be too rich and abundant, constituting plethora, or too watery or otherwise depraved, as in anæmia, scurvy, &c. The true causes, therefore, are such as produce either of these conditions.

1. The causes of deranged innervation are almost innumerable. Among the most prominent is the abuse of tea, coffee, alcoholic drinks, and tobacco. These induce an irritable state of the nervous system, in which it is liable to disturbance from causes that ordinarily only sustain its healthy action. It may be objected to this statement, that strong tea is sometimes very efficient in the relief of palpitation. This is exactly what might be expected. The morbid condition is not the direct result of the stimulant, but that which follows its long-continued use. The resulting disorder is relieved for the time by a fresh dose; as the horrors which succeed a debauch are relieved by an additional

draught of the poison. Similar in their influence are various other causes which habitually and unduly excite the nervous system, such as severe study, diversified mental excitement, and all sorts of sensual excess. The depressing emotions, sedentary habits, and loss of rest have a similar effect directly. It has often been remarked that students just entering into manhood, and especially medical students, are peculiarly liable to palpitation. This may be readily accounted for by referring to the above list of causes.

Numerous diseases have the occasional effect of inducing palpitation. It is frequently the result of a gouty or rheumatic irritation, affecting the heart through the nerves. Dyspepsia is a fruitful source of it, partly by a direct irritation imparted through the nervous centres, partly by that irritable state of the nervous system which it is so apt to induce. The same may be said of hepatic disease. Any irritation in the alimentary canal may be propagated to the heart, and occasion palpitation. Hence it arises from flatulence, acid in the stomach and bowels, and intestinal worms, especially the tape-worm. It is a very frequent attendant upon hysteria; and many violent cases may be traced to tenderness in the spine. Pulmonary disease produces it either by a direct sympathy, or by modifying the influences which the heart receives from the blood. Everything that causes pressure upon the heart may also derange its actions. Tight lacing, ascites, tympanites, abdominal tumours, and the pregnant uterus may all have this effect.

2. The causes which act through the blood are such as induce plethora on the one hand, or an impoverished or depraved state of that fluid on the other. These are sufficiently treated of elsewhere. (See *Plethora, Anæmia, Scurvy.*) An excess of nutritive or stimulant matter in the blood operates by directly exciting the heart into excessive action; and the affection, when unattended with fever, hemorrhage, &c., is considered simply as palpitation. In this case, the pulsations may be strong and regular; differing very strikingly from those which mark the affection as arising from other causes. Anæmia is one of the most frequent causes of obstinate and excessive palpitation. Its mode of operation is easily understood. The actions of the heart in health are exactly proportionate to the wants of the system in relation to the supply of blood. Let these wants be increased, as by vigorous muscular exertion or cerebral excitement, and the heart responds by an increase in the force or frequency of its contractions; let them be diminished, as by rest, and the actions of the heart are diminished. These wants are made sensible by the nerves proceeding from all parts of the body to the nervous centres; and thence is transmitted the influence which regulates the heart. Now, in anæmia, the blood, being deficient in its healthy qualities, does not adequately meet the requisitions of the nutritive and other functions, and more of it is demanded to produce the necessary effect. The wants of the system are therefore greater; the sense of them is transmitted to the nervous centres more strongly; and a corresponding increase in the stimulant influence sent to the heart is the consequence. This organ is, therefore, stimulated, and often powerfully so, by the state of the blood. Of course the stimulation is felt most strongly when there is any additional duty to be performed by the blood; and consequently the least exertion is sufficient to induce palpitation. In this form of the complaint, the pulsations, though frequent, are not usually strong, because the heart wants power. On the contrary, they are apt to be weak, intermittent, and irregular, with a pulse, which, though it may be voluminous, and sometimes short or sharp, is always easily compressible. In this form also it is, that the cardiac murmurs are so much like those of valvular disease. Unlike mere nervous palpitation, this is aggravated by active exercise. The depraved state of the blood, in scurvy and malignant diseases, may give rise to palpitation of the heart, upon the same principles as its diluted state in anæmia.

The age at which palpitation is most frequent is that which intervenes between puberty and perfect maturity. Females are more apt to be affected with it than males.

Paroxysms of palpitation, in one predisposed to it, may be induced by anything of an exciting nature, whether intellectual, emotional, or purely physical.

Diagnosis.—The most important point, in the diagnosis of palpitation, is to decide whether, in any particular case, it is or is not connected with organic disease of the heart. Rules have already been given, under the general head of functional diseases of the heart, in relation to cases in which the signs may be considered as certain. In others, the decision must be made upon the ground of strong probability. When palpitation occurs paroxysmally, with perfect intermissions; when it is apparently traceable to some one of the causes of functional disturbance above enumerated; when it occurs in a young person, or in a nervous or hysterical subject, and increases and subsides with the rise and subsidence of other nervous symptoms; when it is relieved by exercise, or, if not so, shows an evident connection with anæmia; when its paroxysms come on during perfect ease; when it is unattended with valvular murmurs, or these, if present, are perceptible equally on both sides, and only with the first sound, and little if at all in perfect calmness of the heart; and, finally, when venous and arterial murmurs coexist with the palpitation; when all or most of these circumstances exist, there can be little doubt that the affection is purely functional; and, in proportion to the number of them which are observable in any instance, and the degree to which they prevail, will be the probabilities in favour of this view of the subject. The pulse in palpitation, unattended with altered structure of the heart, however violent and tumultuous the action may be, is destitute of the extraordinary hardness and strength which characterise the pulse of hypertrophy; nor is the sensation of heaving force so strongly felt, when the ear is applied to the chest. Another point of distinction, according to Dr. Joy, between the palpitation of functional and that of organic disorder, is the greater feeling of distress usually attending the former.

Effects.—It may be readily conceived that excessive palpitation, frequently repeated and long continued, may at length induce hypertrophy; and what is at first merely nervous may thus end in organic disease. Injurious results may also happen to other organs, from the irregular supply of blood consequent on this affection.

Treatment.—In the treatment of functional palpitation, the most important point is to remove the cause. The habitual use of all nervous stimulants and narcotics, including tea, coffee, and tobacco, should be suspended or abandoned; injurious habits of indulgence should be overcome; the most watchful guard should be kept by the patient over his emotions, and, while the mind is moderately occupied, all over-exertion should be avoided; a due amount of sleep and of bodily exercise should be obtained; and, whenever there may be reason to suspect the agency of some other disease, our efforts should be especially directed towards its removal. As the anxieties and fears of the patient tend strongly to aggravate and perpetuate the complaint, we should endeavour to cheer him by every assurance of a favourable termination which the circumstances of the case may justify.

It would be out of place to detail the various modes of cure adapted to the several diseases, of which the palpitation may be a result, or by which it may be sustained. It will be sufficient to say that, if the patient is clearly plethoric, with a full strong pulse, he should lose blood, take saline cathartics, and live upon vegetable food or milk until this condition has been subdued; if anemic, he should, on the contrary, use chalybeates and a generous diet; if gouty or rheumatic, he should be treated with colchicum, antacids, laxatives, and stimulating pediluvia; if dyspeptic, he should pay especial attention to his diet; exercise freely in the open air, and employ mild tonics and laxatives; in fine, whatever source of irritation to the heart can be discovered, whether existing in the lungs, the liver, the intestines, the uterus, or the spine, should receive a careful attention, and be removed if possible. In the case of spinal tenderness, recourse should be had to cups or leeches over the tender spot, followed by blistering or pustulation. Tight lacing, and all other artificial modes of cramping the movements of the heart, should be avoided.

In the paroxysms, relief will often be afforded by the nervous stimulants, as assafetida, musk, valerian, the ammonical and ethereal preparations, camphor, strong tea, &c. Among the best of these are Hoffmann's anodyne, and the aromatic spirit of ammonia, which may be given separately or mixed. The preparations of opium or hyoscyamus, or one of the other narcotics, may sometimes be usefully conjoined with the antispasmodics. A fluidrachm of the camphorated tincture of opium will often afford relief. Aromatics, combined with antacids, are sometimes useful by expelling flatus and correcting acid. One or two fluidrachms of the compound spirit of lavender may be given with this view, in connection with aromatic spirit of ammonia. When an overloaded stomach is suspected as the exciting cause, an emetic dose of ipecacuanha may not be amiss. Should a gouty or rheumatic diathesis exist, and stimulants be indicated, a good preparation is the ammoniated tincture of guaiac. None of these remedies, however, should be employed when the palpitation is dependent upon plethora.

To control the tendency to excessive action in the heart, digitalis may be cautiously administered, in cases not attended with great debility, and should be continued for a considerable time. Hydrocyanic acid has also been recommended. These remedies should be seconded by measures calculated to invigorate the system, such as exercise in the open air, which should be of the passive kind in anemic cases, the occasional or daily use of the shower-bath, frictions to the surface, and a diet of nutritious and easily digested food.

II. SYNCOPE.

Syncope is a diminution or temporary cessation of the action of the heart, with loss of consciousness, and a suspension more or less complete of respiration. It sometimes comes on suddenly; but is much more frequently preceded by premonitory signs, such as a feeling of nausea or of sinking in the epigastrium, clouded or otherwise disordered vision, mental confusion, pallid and shrinking features, and a rapidly failing pulse. In general, the preliminary sensations are disagreeable, sometimes exceedingly so; but occasionally they are grateful to the patient. In complete syncope, the features are collapsed and of a ghastly paleness, the surface cool, the pulse quite absent at the wrist, respiration suspended, and consciousness entirely wanting. Sometimes involuntary discharges take place from the bowels and bladder. The heart, however, seldom quite ceases to beat. The ear applied to the chest will generally detect the first sound, greatly weakened, but not the second. This is an important sign in diagnosis; as, when observed, it always gives hope of saving life. After a short time, the patient again draws his breath, colour gradually reappears in the lips and cheeks, the pulse may be felt at the wrist, consciousness returns, and very soon the recovery is complete. This is sometimes attended with feelings of much distress.

It very frequently happens that the syncope is only partial; the preliminary symptoms above mentioned being exhibited in a greater or less degree, but the patient never entirely losing consciousness, nor entirely ceasing to breathe; while the pulse, if not perceptible at the wrist, may be felt in the larger arteries. Such a state is frequently designated as faintness, especially in its lighter grades.

The duration of syncope is variable, sometimes not more than an instant, usually some seconds or minutes, and, in certain rare instances, extending to hours or days. The cases of apparent death, in which it is believed that premature interment sometimes takes place, are of this kind. Instances have occurred in which the pulse, respiration, and consciousness have been absent for several days, and yet the patient has ultimately recovered. The system is in a sort of hybernation, in which vitality remains, though the vital functions are suspended. It is probable that, in such cases, a very careful auscultation might detect a slight sound in the heart.

Causes.—These are such as act either directly upon the heart, or indirectly through the nervous system. Of the first set of causes there are comparatively few, if we except the organic diseases of the heart, which not unfrequently produce syncope, and occasionally terminate in that way. Among the direct causes, however, may be ranked sudden attacks of neuralgia of the heart, translated rheumatism or gout, certain poisons which operate immediately upon the circulation, especially the antimonials, and a state of depression following excessive excitement of the organ. To the same category may be referred the sedative influence of the warm bath, the presence of air in the circulation, and a stroke of lightning. Air, admitted into the large veins, in consequence of surgical operations, has, in numerous instances, produced fatal syncope. It probably acts by entering the cavities of the heart, and depriving the organ of the requisite stimulus. The idea has been suggested, that air is sometimes spontaneously developed within the blood-vessels during life; but no satisfactory proof of the occurrence has been advanced.

The causes of syncope which act on the heart through the nervous system are very numerous. Whatever opinion we may entertain as to the inherent and independent irritability of the heart, this much is quite certain, that it is under the controlling influence of the nervous system, and often ceases to act when that influence is suspended or perverted. Violent shocks, which paralyze the cerebral centres for an instant, are frequent causes of syncope. Hence the effects of sudden intelligence, whether exciting or depressing; of certain offensive or fearful sights, as a public execution, or a painful surgical operation; of sudden and excruciating pain, as sometimes in spasm of the stomach or bowels; and of violent injuries, whether from accident, or the knife of the surgeon.* Much milder impressions on the nervous system often have the same effect upon the heart; such, for example, as result from certain rich and oppressive odours, the feeling of nausea connected with gastric disorder, the sensations excited in pregnancy by the movements of the fœtus, and excessive hunger, or rather want of food. The presence of indigestible matters in the stomach sometimes has a powerful effect of this kind. A well-known case of protracted syncope, in which the subject, a gentleman of this city, narrowly escaped interment, but ultimately recovered, and lived many years, was believed to have resulted from the eating of fresh and badly baked bread. Cold water, drank when the body is very hot and perspiring, especially after exercise, is apt to induce syncope of an alarming and often fatal character. Under the head of causes acting through the nervous system, may also be placed certain powerful poisons, as digitalis, tobacco, and hydrocyanic acid.

Deficiency or loss of blood is well known to be a frequent cause of syncope. How far this acts directly on the heart is not certain. There can be no doubt that this organ must feel any deficiency in its wonted stimulus; but there is nevertheless reason to believe that the cause acts more powerfully through the brain than immediately upon the heart. When the former organ is defectively supplied with blood, the latter appears to feel the consequences almost instantaneously. Hence, the loss of much less blood is required to produce fainting in the erect than in the horizontal position. Hence, too, it not unfrequently happens that a person, already weak from deficiency of blood, faints suddenly upon attempting to sit up in bed, or to rise and walk. Sudden death is occasionally produced in this way in diseases of debility. Excessive loss of blood, with consequent syncope, may occur from the operation of bleeding, from accidental wounds, and from spontaneous hemorrhage. The quantity requisite for the effect differs greatly in different individuals, and in different states of system. The robust and plethoric will bear a much greater loss, as a general rule, than the feeble and anemic, and the very fat; and inflammatory diseases much more than the typhous or scorbutic. But individuals also have idiosyncrasies, in this respect, which cannot be explained by any general rule; one person, for instance, fainting from a small loss of blood, and another bearing an enormous loss without this result, though there may be in other respects no very observable difference between the two. The rapidity with which the blood is withdrawn has much effect. Fainting is produced by a smaller loss when the bleeding orifice is large than when it is small. Profuse discharges from excessive secretion, as in cholera and diarrhœa, often produce syncope. The sudden removal of a long-continued pressure upon any portion of the body, has the same effect. Hence the fainting which sometimes follows delivery, and the operation of tapping, unless care is taken to supply the place of the lost pressure by that of a bandage. The effect, in these cases, may be ascribed in part to a loss of balance between the blood in the brain and in the newly liberated vessels, but much more to the effect upon the nervous centres of the feeling of vacuity, consequent on the removal of the pressure.

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* Connected with this suspension of the heart's action from shock upon the nervous centres is the fact, determined by experiment, that, if the par vagum be divided, and the end of the lower section be irritated, the heart ceases to act, though respiration continues. (*Archives Générales*, Déc. 1854, p. 748.)

Diagnosis.—The only conditions from which syncope may not be readily distinguished are apnœa and death. In the former there is the same absence of consciousness, respiration, and pulse at the wrist; but the aspect of the body is in general sufficiently diagnostic. In apnœa there are signs of general venous congestion, such as purple lips, swollen features, and a dingy or livid hue of the surface; while in syncope the countenance is pallid and collapsed, and the skin apparently bloodless. The cause, if known, will also frequently serve to aid in the diagnosis. If it be such as acts primarily on the lungs it produces apnœa, if upon the heart, syncope.

There is a condition of insensibility of an hysterical character, in which the patient lies, sometimes for days, without motion or consciousness, and in which the breathing is so gentle that, without close examination, it may be supposed to be suspended. I have been sent for, in such a case, to decide whether death had not taken place. The physician, however, has no difficulty in the diagnosis; for, upon placing the fingers upon the wrist, he finds the pulse beating as in health. An accidental deviation of the radial artery from its ordinary course, an event not at all uncommon, might in such a case lead to a very false conclusion, if the physician should not be upon his guard, and examine the pulse elsewhere.

The most embarrassing problem, in relation to the diagnosis of syncope, is to decide between cases of apparent and positive death. In prolonged syncope, we might expect something in the general aspect of the case different from the exterior cadaveric characters, though it would be difficult to say what. There is occasionally something life-like in the countenance and surface, which has led on the part of observers to persevering convictions of continuing life, which the event has justified. In such cases, the interior temperature should be observed, and, if higher in the fauces or rectum than upon the surface, it must be considered as a favourable indication. The probability is, that a careful auscultation of the heart might detect some faint remaining sound. There is an absence, moreover, of the cadaveric rigidity, which is probably the last vital act of the expiring tissues, occurring some time after the great functions of life have been suspended. In real death, there is a sinking of blood to the most dependent parts of the body, indicating the complete surrender of the vital powers to the ordinary physical laws. But, whenever there is any doubt, the body should not be buried until after the commencement of putrefaction, which is quite decisive. Happily, the warmth necessary to the restoration of the patient, if living, hastens the occurrence of this decisive test in death.

Prognosis.—This is generally favourable, when the syncope is unconnected with organic disease. Sometimes, however, the affection is fatal when it proceeds from the loss of blood, even though the hemorrhage may have ceased, from severe shocks upon the nervous system, and from slight exertion in cases of great debility. There is reason to believe that death takes place occasionally from syncope, consequent upon some sudden affection of the heart, paralyzing its power of contraction; as the closest post-mortem examination, in instances supposed to be of this kind, has failed to detect any lesion to which the result could be ascribed.

Treatment.—The first thing to be done in syncope, threatened or existing, is always to place the patient in a horizontal position, with the head at least as low as the rest of the body, if not lower. By this simple measure, employed when the premonitory symptoms are first felt, an attack may very frequently be averted; and it is also one of the most effectual means of restoration after the attack; sometimes, indeed, absolutely essential to recovery. Hence the importance of distinguishing such cases from those dependent upon congestion of the brain. An individual, subject to syncope, should at once lie down when he feels an attack approaching. Sometimes, as in cases of excessive hemorrhage, it is necessary to maintain the horizontal position steadily for a considerable time; until, in fact, the blood-vessels are again supplied in the course of nutrition. While this measure is employed, pressure from tight dresses, corsets, cravats, &c. should be carefully removed from the chest, neck, and abdomen, and the patient should be surrounded with pure fresh air.

Means should also be employed to rouse the nervous system. For this purpose spirit or solution of ammonia, strong acetic acid, or other very pungent volatile substance, may be so applied that the vapours may enter the nostrils; but care must be taken not to carry the remedy too far, lest it produce severe inflammation of the part. The smoke of burnt feathers has been employed for the same purpose. Sprinkling cold water upon the face is also useful, by the shock which it produces on the nerves. Slapping the palms of the hands, and making a shrill sound in the ears of the patient are vulgar remedies not without effect. The compression of the great arteries of the extremities, by means of a tourniquet, if applied while the circulation still continues, however feebly, may possibly be followed by good results. If the patient can swallow, he may take a draught of cold water, which seems to act upon the mucous surface in the same manner as on the skin, by exciting a sensation that leads to reaction. Diffusible stimulants should also be administered, especially the ethereal and ammoniacal preparations; and, as in palpitations, the most convenient forms are Hoffmann's anodyne and aromatic spirit of ammonia. In cases of great debility, brandy may be used. Should the patient be unable to swallow, and the syncope not speedily yield to the measures above recommended, stimulants, such as oil of turpentine, brandy, and carbonate of ammonia, properly diluted, should be injected into the rectum. Remedies must also be applied to the surface. The body should be kept warm, but not overheated;

friction should be made with a flesh-brush or coarse flannel; and rubefacients should be applied along the spine and to the extremities, care being taken not to permit them to remain so long, or to be used of such a strength, as to endanger much inflammation on the occurrence of reaction. A good mode of exciting the skin might be one suggested to the author by Dr. Cartwright, of Natchez, that, namely, of slapping the whole surface with a lady's slipper. It has been recommended to apply briefly to the epigastrium, or over the spine, a piece of heated metal, as the blade of a case knife, or the bowl of a spoon, in order to excite sensation; and a live coal from the fire has been employed for the same purpose. Electricity may be cautiously used; and recourse should be had to artificial respiration in cases which resist other measures, though the same good is not to be expected from this remedy as in asphyxia.

When the syncope has proceeded from large draughts of cold water taken into the stomach in hot weather, the patient, if able to swallow, should take full doses of laudanum, with ether, solution of ammonia, hot brandy-toddy, or even water alone made as hot as it can well be borne, and, in cases of complete unconsciousness, these or similar remedies should be administered by means of the stomach-tube. The other remedies above mentioned may be used at the same time, and especially a sinapism over the epigastrium.

When an overloaded stomach, or some acrid or indigestible matter in the stomach, is the cause of the affection, it is proper to administer an emetic of powdered mustard with warm water or warm chamomile tea, which may be aided if necessary by a little ipecacuanha.

III. NEURALGIA OF THE HEART, OR ANGINA PECTORIS.

Neuralgia of the heart and angina pectoris are considered by some as different diseases; but it is impossible to point out any important distinction between them. Though angina has frequently been found in connection with organic disease of the heart, yet frequently also no such affection has been detected upon examination after death; so that it must be considered as essentially nervous. Angina is, therefore, a painful nervous affection, and this is the very definition of neuralgia. If it be maintained that angina appears under a peculiar characteristic form, differing from other painful affections of the heart, it may be stated in reply that, though there may be striking differences between two extremes of any affection which admits of diversity, yet this is not a valid reason for constituting them into distinct diseases, especially when, as is the case with the complaint in question, the extremes are connected by a chain of insensible gradations, so that they cannot be separated without doing violence to some link. The only admissible distinction between the terms appears to be, that, while neuralgia shall be considered as embracing all the purely nervous cardiac pains, angina pectoris shall be limited to the more violent and dangerous. It does not follow from the name of neuralgia of the heart, that the disease is seated essentially or exclusively in that organ; on the contrary, the great probability is, from the often wide diffusion of the morbid phenomena, that the special seat of the disease is, often at least, in the plexus formed by the pneumogastric and great sympathetic, which supplies both the heart and lungs, and is connected also with the brachial plexus, and thus explains the participation of the organ of respiration and of the arm in the morbid phenomena.

Symptoms.—The disease is characterized by severe pain in the precordial region, occurring paroxysmally, with freedom from pain in the intervals. In the paroxysm, the pain generally shoots through the chest towards the back, and into the left shoulder, and not unfrequently extends down the arm, where it is attended with a feeling of numbness. This combined sensation is sometimes felt as far as the fingers, proceeding downward from the elbow along the course of the ulnar nerve. Sometimes also the pain spreads to the anterior part of the chest, ascends the left side of the neck, or descends to the left leg; and cases are mentioned in which it has even extended to the right side of the body. There is occasionally exquisite tenderness of the left mamma in the female, and pain upon pressure in different parts of the chest, both anteriorly and posteriorly, in both sexes. There is every grade of violence in the sensation, from a dull aching numbness, up to the most acute and excruciating pain, for which the imagination of the sufferer has laboured in vain to find terms of comparison sufficiently expressive. Along with the pain, in bad cases, there is often a sense of tightness or oppression in the chest, with dyspnœa, inability to lie down, and sometimes violent palpitations; and the patient not unfrequently has the feeling that he cannot live unless speedily relieved. Though the breathing is apparently much oppressed and difficult, yet the lungs can generally be fully expanded by a voluntary effort. The pulse is usually small, irregular, and feeble, but sometimes strong and voluminous. Occasionally, the paroxysm ends in convulsions or syncope. There is often much flatulence of stomach, and the urine during the paroxysm is pale and limpid.

The paroxysm varies in length from a few minutes to half an hour, or an hour, and sometimes, though rarely, exceeds the last-mentioned period. The patient is sometimes free from pain, and in apparent health, during the intervals; but more frequently he suffers with occasional uneasiness in the præcordia, and often exhibits signs of cardiac disease.

The first attack, which is in most cases comparatively mild, is usually experienced upon the occasion of some extraordinary exertion, such as ascending a height, especially in the face of a cold wind. The patient is suddenly seized with pain, and immediately stops, feeling that it is impossible for him to advance, and as if he should die were he to make the effort. After a few minutes, however, the pain subsides, and he is enabled to proceed. The attack is afterwards repeated, but at a very uncertain interval, after one or more weeks, for example, or months, or a year; but the interval generally diminishes with the continuance of the complaint; so that at length the patient becomes liable to a paroxysm upon the slightest excitement, and even without any apparent exciting cause. In this condition, any movement of the body, or any mental emotion, however slight, may become the cause of pain; and the swallowing of food, the act of defecation, turning in bed, coughing, or other equally insignificant cause, is sufficient to induce a paroxysm. The patient is not unfrequently attacked at night, especially, as it is said, after the first sleep. He is now scarcely ever free from suffering or the apprehension of it, and life not unfrequently becomes a burden, which he is glad to lay down. Cases which have advanced thus far sometimes terminate suddenly, in fatal syncope. The patient is frequently also carried off by some of the secondary affections incident to organic disease of the heart, in which simple neuralgia, if severe and long continued, is apt to terminate.

But there are many cases much less severe than those above described. The pain may not be less acute; but it is not so extensive, recurs quite irregularly both as to degree and time, and may disappear for a very long period, or never return. There are, indeed, fugitive pains in the heart as in other organs, depending on various causes of nervous derangement, and quite trivial in their nature, which it is necessary, if they are classified at all, to place along with neuralgia. The same may be said of that sort of uneasy feeling about the heart, extending often to the shoulder and arm, which consists in a sense rather of stricture, weight, or aching numbness, than of positive pain, and which is not uncommon in nervous and dyspeptic patients of a gouty or rheumatic constitution.

Instances of cardiac neuralgia have been observed, in which the paroxysms returned at certain fixed periods, with perfect freedom from pain in the interval. Such cases are strictly analogous to the intermittent or periodical neuralgia, which frequently occurs in other parts of the body.

It is asserted that angina pectoris has sometimes disappeared upon the breaking out of certain eruptions upon the skin.

Dissection often reveals nothing to which the complaint could be ascribed; but often also organic disease has been observed, such as ossification of the coronary vessels, valves, or aorta; hypertrophy, dilatation, or softening of the heart; morbid obesity, and pericardial effusion. It is impossible to determine how far these diseases are mere accidental coincidences, and how far they stand towards the neuralgic affection in the relation of cause or effect.

Causes.—These are often very obscure; and, as in other cases of obscurity, various opinions have been advanced by authors. Dr. Parry, whose attention was particularly called to ossification of the coronary arteries, ascribed the disease to that lesion; and a case is recorded by Dr. Henry Osborne, in which, along with a dilated and atheromatous condition of the aorta, there was rupture of the coronary artery and consequent hemorrhage into the pericardium, to which the symptoms of the disease and the death which soon followed, were ascribed. (*Med. Times and Gaz.*, March, 1862, p. 317.) By others it has been referred to general plethora, to gout, to affections of the pericardium, to spasm of the diaphragm, and to organic disease of the liver or other abdominal viscera. Dr. Hope was inclined to the belief, that, in its worst forms, it was owing to structural disease of the heart or great vessels, in which some portion of them were deprived of their elasticity by osseous, cartilaginous, or steatomatous degeneration, and that the pain was owing to over-tension of the rigid portion. But these affections so often occur without any trace of angina, and angina has been so often observed without structural disease, that great doubt is necessarily thrown over the correctness of this opinion. I am disposed to believe that, where the two affections coexist, they are both the result of the same morbid cause, or that the organic is the consequence, as so often happens elsewhere, of the continued functional derangement. The opinion of the late Prof. Chapman, that angina is a gouty affection, is probably true in at least a large number of cases; and the tendency of gouty irritation to favour the deposit of calculous matter in the fibrous tissues is well known. Both the pain and the ossification may in such instances be nothing more than gouty phenomena. So far as my personal observation has gone, neuralgic affections of the heart have generally occurred in persons who have inherited a gouty or rheumatic diathesis, but whose habits of life, more abstemious than those of their forefathers, have prevented the ordinary inflammatory development of those diseases, and given them a disposition to assume a neuralgic form. The disease has been ascribed in some instances to a scorbutic state of system; and an account is given by M. Gélineau of a large number of cases, which occurred in a French ship of war coincidently with an attack of scurvy. (See *Am. Journ. of Med. Sci.*, Oct. 1863, p. 528.)

Like neuralgia in other situations, that of the heart may be associated with, and possibly in some measure dependent upon general debility, nervous derangement of the system at large, and the chlorotic or anemic condition of the circulation. It is one of the forms in which hysteria shows itself, and is apparently, in some instances, connected with tenderness of the spine. It occasionally alternates with neuralgia elsewhere, especially in gouty or rheumatic individuals. It has sometimes appeared to originate in continued and deep distress of mind. There is good reason to believe that it is sometimes a result of miasmatic influence. It has been ascribed also to the abuse of tobacco. Occasionally it is associated with general plethora, which may possibly serve as the exciting cause. Dyspepsia and disease of the liver often occasion neuralgic sensations in the heart, probably through the nervous centres which associate the seats of these affections. The complaint is apt to come on when the stomach is overloaded with food, distended with flatus, or irritated by acid or indigestible matters. The communication of the irritation is probably effected through the instrumentality of the pneumogastric nerve; and it is not improbable that disease at the origin or in the course of this nerve may sometimes be the source of the affection. Males over fifty are most liable to the severest forms of this complaint; females less advanced in life to the milder.

Prognosis.—When the disease is associated with structural alteration in the heart, the prognosis is very unfavourable, though the patient often lives long. Under other circumstances, the affection may very generally be alleviated, and sometimes cured. When gouty, though removed for a time, it is always liable to return, because the diathesis can scarcely be eradicated.

Treatment.—The remedial measures are *first*, those adapted to the paroxysm, and, *secondly*, those which are to be used in the interval.

1. During the paroxysm, the patient should be kept at rest. If the pulse be strong, and the general habit plethoric, blood may be taken freely from the arm; but bleeding is not often required, and, when the disease is associated with general debility, or anæmia, would be positively injurious. Whenever the patient is habitually pale, with a languid circulation, and a generally feeble state of health, blood should be taken very cautiously, if at all, and by cups or leeches between the scapulæ, rather than by the lancet. Local bleeding may also be used, as an adjuvant of venesection, should this be required.

To relieve the pain, anodyne and antispasmodic medicines should be given freely; and none are so efficacious as the preparations of opium, such as laudanum, the black drop, the deodorized tincture, and the salts of morphia, of one of which a large dose should be given promptly, and repeated if the first should not prove successful. Inhalation of chloroform has been recommended for the same purpose. When there is a gouty or rheumatic tendency, the wine of colchicum root should be given pretty freely along with the anodyne. Should the pulse be feeble, the skin cool, and the action of the heart corresponding, the ammoniacal or ethereal preparations, musk, assafetida, or camphor, should be prescribed, separately or variously combined; and, in such cases, with a gouty or rheumatic taint, ammoniated tincture of guaiac may be substituted for the preparation of colchicum. Should evidences of acid or flatus in the stomach exist, carbonate of ammonia, or aromatic spirit of ammonia, is well calculated to meet the indications; or various mixtures of aromatics and antacids may be administered. When there is reason to suspect an overloaded stomach as the cause, vomiting should be produced by ipecacuanha, aided by warm water or infusion of chamomile.

Hot pediluvia, rendered more stimulating by mustard or Cayenne pepper, should be employed simultaneously with the internal remedies, especially in gouty cases. Speedy rubefaction over the region of the heart, by means of strong solution of ammonia or sinapisms, is sometimes desirable; and similar applications to the spine may not be without advantage. Laennec recommends the application of two magnets on opposite portions of the chest; but their effects are probably produced through the mind of the patient. Acupuncture is said to be sometimes useful.

2. In the interval, the exciting causes should be carefully avoided, and the patient should, therefore, sedulously cultivate calmness of mind and perfect equanimity, while he avoids all vigorous muscular effort. At the same time, the general health should be carefully attended to as the best safeguard against the attacks of the disease. Dyspepsia should be corrected with especial care, along with its concomitants, acidity, flatulence, and constipation. (See *Dys-*

pepsia.) In the choice of exercise for the support of the general health, the passive kinds, as on horseback, or in a carriage, should be decidedly preferred to the active. Any existing morbid tendency which may have predisposed to the disease, or excited it, should receive due attention. Hence, gout, rheumatism, anæmia, or hysteria, if present, should be treated with appropriate remedies; but, when either of the first two of these affections is seated in a safe spot, caution should be observed not to remove it by repellent measures.

Sometimes advantage will accrue from a strong impression upon the nervous system by means of the metallic tonics, associated with narcotics. Nitrate of silver, subcarbonate of iron in half drachm or drachm doses, subnitrate of bismuth, the salts of copper, or those of zinc, may be given in connection with the extract of belladonna, of stramonium, or of hyoscyamus, or of the three combined. For the periodical cases, sulphate of quinia is the appropriate remedy. The paroxysms, when apt to occur at bedtime, may sometimes be effectively anticipated by a full dose of opium.

Nor should local remedies be neglected in the intervals. Issues in the thighs have been highly recommended. Blistering, antimonial pustulation, setons, or issues, may be employed on the back between the shoulders. Advantage has also accrued from a belladonna plaster upon the breast, and from frictions with aconitia or veratria.

Finally, in very obstinate cases, not attended with serious structural disease of the heart, much good may be expected from the mental distraction, various enjoyments and exciting novelties of foreign travel, which places the nervous system under wholly new influences, and often subverts those tenacious morbid associations which sustain, if they do not originate neuralgia.

SUBSECTION II.

DISEASES OF THE ARTERIES.

Article I.

INFLAMMATION OF THE ARTERIES, OR ARTERITIS.

THE arteries are one of the components of our frame least liable to inflammation. It is not unusual to find arterial trunks wholly sound, though surrounded with inflamed and even suppurating structure. Hence it may be inferred that idiopathic arteritis is a rare disease. Some pathologists, however, have adopted a contrary opinion, based upon the supposition that the redness, often observed after death upon the inner surface of the arteries, is of an inflammatory character. Among these was Dr. Frank, of Vienna, who regarded arteries as the essential cause of a very peculiar and dangerous form of fever. But a closer scrutiny has determined that the redness is not a certain evidence of inflammation, but is, on the contrary, in general, the result of imbibition of blood after death, or during the last agony. The observations of Chaussier, Laennec, Bérard, Andral, MM. Trousseau and Rigot, and Dr. Hope, all concur to this end. The inference, therefore, as to the frequency of arteritis, drawn from the phenomenon alluded to, is not supported; and all other considerations lead to the conclusion that it is rare.

The want of vascularity in the interior membrane of the arteries would appear to be the chief cause of their resistance to ordinary causes of inflammation. Trousseau and Rigot found that neither alcohol of the sp. gr. 0·835, nor dilute nitrous acid, nor putrefying animal substances, occasioned inflammatory action in the arterial lining membrane. (*Hasse's Anat. Descrip. of Dis. of Circ. and Resp.*, Lond ed., p. 59.)

Symptoms.—The symptoms of arteritis are very uncertain. When moderate and of small extent, as it ordinarily occurs, for example, after the tying of an artery, it scarcely gives rise to any obvious disturbance. In a higher degree, it is said to occasion heat and pain along the course of the inflamed vessel, tenderness upon pressure, increased pulsation or throbbing, and a rustling sound upon auscultation, which has been ascribed to roughness of the internal surface. When seated in the larger vessels, it generally produces a sympathetic irritation of the heart, and other symptoms of fever, sometimes attended with restlessness, great anxiety, and a feeling of faintness. In the thoracic aorta, it may also give rise to oppressed breathing. The same symptoms, however, may result from so many other morbid conditions, especially in the thoracic and abdominal cavities, that a certain diagnosis is almost impossible; and the practitioner must be content, even in the best marked cases, with a high degree of probability. The absence of any other discoverable lesion or functional disorder, to which the symptoms can be ascribed, will afford good probable grounds for referring them to this cause.

It very seldom happens that the aorta, or other large arteries of the trunk, are absolutely obstructed in consequence of inflammation; but this result is occasionally attendant upon the disease in the arteries of the extremities. In such cases, the vessel, though it may have at first pulsated with more than its usual force, either suddenly ceases to beat, or gradually beats more and more feebly, until pulsation can no longer be felt, either at the seat of the affection, or in the limb below it. The artery may now be felt like a tense cord running along the limb. The obstruction may be owing either to the exudation of fibrin into its cavity, the deposition of fibrin from the blood, or the coagulation of the blood itself; and sometimes to a mere thickening of the coats. Virchow denies that exudation of fibrin ever takes place from the lining membrane of the arteries; founding his opinion upon the want of bloodvessels in that tissue, and supporting it by experiments made upon dogs. He admits, however, that fibrin, exuded in consequence of inflammation of the outer and middle coats, may find an entrance into the cavity of the vessel by rupture of the lining membrane. It is of little consequence, pathologically, whether the fibrin enters the artery by rupture of the lining membrane, or exudation through it; but he has, I think, adduced nothing which proves that the latter condition may not occur in this, as in other cases of exudation upon the surface of non-vascular tissues. The blood appears to have a strong tendency to coagulate upon the inflamed surface of the vessel, and the clot sometimes extends for a great distance along its course, blocking it up completely. The limb sometimes becomes swollen and painful during the progress of the disease; but, when the obstruction has occurred, the phenomena resulting from a deficient supply of blood are exhibited in a degree proportionate to that of the obstruction. A feeble or absent circulation, diminished temperature, a sensation of numbness or even paralysis, and lastly mortification, preceded by gangrenous phlyctænæ, are among the results. It is highly probable that many of the cases of apparently spontaneous gangrene of the extremities have their origin in inflammation of the arteries. The blood in the vessels of a mortified part coagulates; but the coagulation does not necessarily extend far beyond the seat of the affection. In these cases of supposed spontaneous gangrene, the main artery has been observed to be filled, far above the utmost limit of the mortification, with coagulated blood adherent to its inner coat, or separated from it by a layer of pus; showing that the original disease was probably in the vessel itself, and the gangrene, therefore, a result and not a cause. It would, however, be going too far to assert that, in all instances, ammation and obstruction of the *pulmonary arteries* are somewhat ar in their results. As these are not, exclusively at least, the nutrient es of the lungs, the obstruction is not necessarily followed by gangrene. are no symptoms by which the affection can be diagnosticated with an ach to certainty during life; and, of the cases on record, most if not all been first discovered upon dissection. Of course, complete obstruction be followed by speedy death from suspended circulation. But this is and when it occurs is probably not inflammatory. Partial obstruction xist to a considerable extent, without necessarily destroying life, or even y disturbing respiration or other important functions. As explained by 'aget, if the amount of obstruction is small, the defect is supplied by a r energy of action in the right ventricle, increasing the rapidity of the it; if more considerable, the balance of circulation is maintained by the ished action of the left ventricle, consequent on the diminished supply od from the lungs; while the excess of blood accumulates in the veins. ay be thus maintained for a considerable time, with symptoms, of course, mia, venous congestion, and general debility. But the patient is al- in danger, proportionate to the degree of obstruction; and death may lace, either gradually, by the slow increase of the coagulation, or more ly, by an accidental attack of some disease, which the system, in its de- d state, may be unable to resist, or some unusual excitation or muscular on, by which the systemic arteries may be emptied more rapidly than an be supplied. The immediate cause of death is the want of due im- on on the cerebral nervous centres, or deficiency of blood in the heart. lood which passes through the lungs is properly aerated, and the ordi- ymptoms of apnœa or asphyxia are, therefore, not presented.

s clear that diminished nutrition in the various organs, short of gangrene, ensue from partial arterial obstruction. Thus, the heart and brain may go fatty degeneration from this condition in the arteries which supply respectively with blood; and syncope or a tendency to it in the one case, alsy or apoplexy in the other, may result.

the advanced stages of extensive arteritis, a new set of phenomena are times presented, consequent upon the contamination of the blood with us, lymph, &c., which may be secreted by the inflamed interior mem- , or thrown out into the cavity of the vessel from abscesses in its coats, tendency in arteries, unlike that of the veins, is to propagate inflammation towards the circumference, instead of the centre of the circulation.

From the evidence of dissection, it may be inferred that *chronic inflammation* of the arteries is not unfrequent; if it be admitted that the various organic changes which have been noted, such as alterations of texture and thickness, and different kinds of morbid deposition, are really the result of the inflammatory process. But there are seldom symptoms sufficiently marked to characterize the affection, before the organic change has taken place; and this then becomes the prominent object. (*See the next article.*)

Anatomical Characters.—Redness of the internal coat has been before stated not to be admissible alone as an evidence of previous inflammation. Scarlet and brown or violet discolorations are frequently the result of mere imbibition of blood. Bérard considers the proposition incontestible, that "the red bands and patches of the internal surface of the arteries, which are not attended with any other appreciable physical change in the coats of these vessels, are not of an inflammatory nature." (*Dict. de Méd.*, iv. 100.) But, when the redness is accompanied with a roughness or loss of polish upon the interior surface; injection of the vasa vasorum; softness, friability, loss of elasticity, or thickening of the parietes; a facility of separation between the several coats; and the existence of crude coagulable lymph or of pus, there can be no doubt of the previous existence of arteritis. The lymph has been observed variously in flocculi, patches adhering to the interior surface, and masses to a greater or less extent filling and obstructing the channel of the vessel. Pus is formed upon the inner surface, underneath layers of coagulated blood or false membrane, and sometimes between the coats. But it is not a frequent product of arteritis, which is much more disposed to plastic exudation than the generation of pus. Coagulated blood is frequently observed lining the vessels, or occupying their cavities, sometimes for a great distance. The presence, however, of pus or lymph is probably less frequent than it would be, were not these substances often washed along with the blood as fast as produced. Ulceration is sometimes seen upon the inner surface of the vessel, though very rarely as the result of acute arteritis. All these signs of inflammation are seldom or never observed in one case; nor are they all of equal value. Laennec is disposed to believe that thickening of the coats, and unusual apparent vascularity, may exist in connection with redness, without necessarily implying inflammation, when the body is much infiltrated, and the tissues very moist; and Dr. Hope states that he met with a case presenting these phenomena, which a brief examination proved not to be inflammatory. (*Cyc. of Pract. Med.*, article *Arteritis*) The most incontestible evidence of inflammation is that afforded by the existence of exuded fibrin or of pus.

The marks left by *chronic arteritis* are a dirty redness, thickness, softness, or other organic alteration of the coats, ulceration, and various morbid deposits. Attention has been called by Dr. Hodgkin to constriction and obliteration of arteries at their mouths, consequent upon contraction of the fibrinous deposit produced by inflammation, and to various results of local anæmia from this cause. (*Med. Times and Gaz.*, April, 1856, p. 410.) In relation, however, to the organic changes of arteries, it is by no means certain that they are always the result of inflammation. Some of them, indeed, would appear, from a close scrutiny, to be wholly independent of that process in their origin. But, either as cause or effect, they usually have more or less connection with it; and they may therefore be most conveniently treated of here, so far as they require notice in an elementary treatise, at least with the exception of ossification and aneurism, which will be considered under distinct headings.

Non-inflammatory organic alterations.—Arteries are sometimes found dilated, and sometimes contracted. Of their dilatation occasion will be taken to treat under aneurism. Their contraction is either mere stricture without alteration of their coats, or, as more frequently happens, it is the result of a thickening of one or more of the coats, or a deposition of foreign matters in their substance. In the former case, it is very limited; in the latter, it sometimes affects a considerable extent of the vessel.

The coats of the arteries are variously changed. Occasionally they lose their elasticity, at the same time becoming white, more opaque, and denser than in health, without other appreciable alteration. This condition is said to predispose to dilatation. In other instances, they are thickened as well as inelastic and fragile, especially the inner coat; whence arises a diminution of their caliber, and sometimes even complete obstruction. Sometimes they are much softened; and this also is particularly true of the inner coat. In this condition, the vessel is liable to an accident to which attention was first called by Dr. Turner, in the Transactions of the Medico-chirurgical Society of Edinburgh. In consequence of some movement in which the artery is elongated, the inner membrane is ruptured, and a portion of it, being rolled backward, impedes the current of the blood, and induces coagulation to such a degree as quite to obstruct the vessel. A sudden stoppage of circulation is experienced in the limb below, with all the necessary consequences of the want of blood.

Of the morbid products, one of the most frequent consists of *cartilage-like patches* on the inner surface of the artery. From the researches of Bizot, it would appear that these are the result of acute inflammation; having been traced from their incipient stage of a viscid gelatinous exudation, of a pale rosy colour, through gradual changes, to the state in which they are ultimately found, of firm, white patches, of almost cartilaginous hardness, supplanting the inner coat of the vessel in the places where they are deposited. (*System of Pract. Med.*, article *Arteritis.*) Hasse, however, regards them as deposits directly from the blood. (*Hasse's Anat. Descriptions*, &c., p. 75.) According to the same author, these patches never ossify, differing in that respect strikingly from the affection to be noticed in the following paragraph.

Another kind of product is that which has been variously denominated *atheromatous* (pulpy), *melicerous* (of the consistence of honey), and *steatomatous* (of the consistence of suet), according to its degree of cohesion. It is usually in the form of a yellowish, soft, friable, cheesy substance, either in the areolar tissue between the inner and middle coats, or, according to Bérard, in the substance of the lining membrane itself, between its two laminæ. (*Dict. de Méd.*, iv. 182.) It first appears in numerous minute granules, which coalesce and form masses, sometimes of considerable size. These masses either become the matrix of a calcareous deposition; or, being gradually softened, and converted into a pus-like matter, by a process analogous to the softening of tubercles, produce ulceration or absorption of the middle and inner coat (*Hasse*, 78), and thus escape into the current of the blood, leaving small ulcers behind them. Sometimes the two changes go on simultaneously in the same patch. This substance is found most frequently in the aorta, especially near its arch, and in the great vessels which put out from that trunk, especially near their commencement. There seems to be no reason to suppose that it is essentially the product of inflammation, as no marks of this condition necessarily attend its origin. By the aid of the microscope, it has been found to consist of oily or fatty matter, which was at first supposed to be deposited from the blood. Virchow, however, is of opinion that these atheromatous products are not deposits directly from the blood, but examples of fatty degeneration, which may be the result either of pre-existing inflammation, or of a direct reduction or alteration in the vital functions of the part (*Cellular Pathol.*, Am. ed., p. 396); and this latter idea corresponds with what has always been taught in this work, since the idea of fatty degeneration was first admitted; namely, that in all cases of inflammation, there is, consequent to the excitement, a state of depression, which in its results is closely analogous to those which flow from directly depressing influences; even the formation of pus being an example of commencing fatty degeneration. Its effect, in the small arteries, is sometimes to produce obstruction; in the larger, to weaken their coats so that they yield to the force of the circulation, or to accidental violence, thus giving rise to aneurism, or to rupture and hemorrhage.

Tubercles, and small *abscesses* from ordinary inflammation, are said to exist occasionally between the coats of arteries, and to produce ulcers by opening into the cavity of the vessels. They are, however, very rare, and it may even be doubted, whether, in the cases observed, they were not identical with the atheromatous deposition in some of its stages.

Ulceration.—This is frequently observed as the consequence of the above derangements. It is said to result most frequently from the detachment of the cartilaginous scales from the surface of the vessels, from openings made through the inner coat by the atheromatous matter, or from irritation and inflammation produced by the calcareous deposits. The ulcers vary in size from that of a mustard-seed to that of a split pea, are sometimes superficial and sometimes deep, and occasionally perforate all the coats of the artery, giving rise to fatal hemorrhage. They are also occasionally the first stage in the formation of aneurisms. Hasse states (*Descriptions, &c.*, p. 81) that the ulcers are confined almost exclusively to the abdominal aorta. Sometimes the ulcers produced by the disappearance of the atheromatous matter heal, leaving scars. (*Ibid.*, p. 79.) Ulceration is sometimes propagated to the arteries from disease in neighbouring parts, such as abscesses, wounds, and ulcerous affections, whether simple or malignant.

The morbid conditions above enumerated are seldom found separate. Often several of them are united in the same vessel; and thickness, fragility, and ulceration of the coats may be found in association with the cartilaginous scales, the atheromatous deposit, and osseous degeneration.

Causes.—The causes are, in many instances, not less obscure than the symptoms. It is known that various kinds of violence, as wounds either accidental or surgical, the tying of arteries, and sudden and great elongation of the vessels, sometimes produce arteritis. That it may originate in the vessels of parts inflamed or suppurating, and thence be carried towards the heart, has been already stated. Cold probably sometimes causes it, and it is highly probable that it may result from acrid and poisonous substances, which have found an entrance into the blood-vessels by absorption or otherwise. Perhaps the abuse of alcoholic liquors may operate in this way, as well as by sustaining an excessive action of the heart. The disease is thought also to have arisen from repelled eruptions, and the metastasis of gout and rheumatism. Anything which has a tendency to over-excite the circulation, and thus distend the blood-vessels, or subject them to an extraordinary impulse, may be looked upon as giving a predisposition to it. Hypertrophy of the heart may act in this way. Gouty and rheumatic subjects are thought to be peculiarly liable to the disease. It is probable that an inflammatory constitution of the blood would act as an especial predisposition. Adults are more apt to be affected than children.

Of chronic arteritis one of the most frequent causes is probably the presence of morbid deposits, as of tuberculous, steatomatous, and calcareous matter, which act as irritants to the parts around them. This would be equally true, whether these deposits be considered as themselves originating from inflammation, or as the result of some other morbid process.

Treatment.—Whenever the existence of arteritis can be well made out, if attended with the ordinary symptoms of inflammatory excitement, it should be treated by general and local bleeding, carried as far as the strength will bear. Saline cathartics, with the antimonials and other refrigerants, may be given internally; the patient should be kept at perfect rest in the horizontal position; all compression of the limb or part affected should be carefully guarded against; and the whole antiphlogistic regimen should be adopted. Local bleeding is best effected by leeching along the course of the inflamed vessel. This may be followed by fomentations or cataplasms, and, ultimately, by blisters or pustulating applications. Should the disease not yield to depletion, recourse should be had to the mercurial impression. Calomel may be employed for this purpose, combined with opium, hyoscyamus, or other anodyne, to relieve the pain and restlessness. After gangrene has occurred, it will be necessary to support the system until the processes requisite for the repair of the mischief shall have been completed. Local baths of oxygen have been employed in cases of senile gangrene, by Dr. Demarquay, but without success; their only advantageous effect having been in some cases to correct the fetor and the excessive production of fluid, and in one to relieve pain. (*Arch. Gén.*, Juillet, 1863, p. 128.)

Article II.

OSSIFICATION OF THE ARTERIES.

THIS term has been applied to that condition of the arteries in which, in consequence of the presence of earthy or calcareous matter, they possess a firmness and hardness analogous to that of bones. It has been questioned whether the new structure is really an osseous growth, or merely the result of a deposition of earthy matter in the pre-existing tissues. In favour of the former opinion, is the fact, that, when these concretions are macerated in dilute muriatic acid, a portion of animal matter is left, having the appearance of organized parenchyma. But this may be merely the tissue in which the earthy substance was deposited. Brande found the bony laminæ to consist of 65·5 per cent. of phosphate of lime, and 34·5 of animal matter; and, according to Dr. Hope, the proportion of the latter constituent is, in some instances, considerably less. This is not exactly the constitution of bone. Besides, in the atheromatous formations spoken of in the last article (*page* 235), it has been shown that calcareous particles exhibit themselves at first in small numbers, and gradually increase until they supplant the original pultaceous deposit. Virchow maintains that there are two varieties of what has been denominated ossification. One is a real degeneration of the tissue, in which the proper elements are to a certain extent replaced by calcareous salts, similar in its origin to atheroma, and designated by him *calcification*, or *petrifaction*. It is in fact an example of what has been described in the early part of this work as *calcareous degeneration*. The other variety is true ossification, which, according to Virchow, always forms under a pre-existing irritation or inflammation. The former is apt to take place in the middle, the latter in the inner coat. (*Cellular Pathology*, Am. ed., pp. 406–8.)

The affection is readily recognized by the hardness and diminished compressibility of the vessels under the fingers. In the earliest stage, the departure from the healthy state is slight, and the sense imparted to the touch by the artery is rather that of cartilage than of bone. The firmness, however, gradually increases, until at length not unfrequently pulsation can be felt no longer, and a bony cord seems to have taken the place of the elastic tube. All parts of the arterial system, carrying red blood, are liable to this degeneration. It is exceedingly rare in vessels which convey venous blood, though calcareous formations have been in some instances noticed in the pulmonary artery. Dr. Hope, however, states that, of a thousand cases in which he had examined this vessel, he had never met with this product in a single one. The affection is most frequent in the aorta, and, after this, in its larger divisions. It is stated to be more frequently met with in the ascending portion and arch of the aorta than in any other part of that vessel. It is more common in the lower extremities than in the upper. The ossification is usually partial, occupying but a small proportion of the vessels of the body; but sometimes it is almost universal. A case is recorded by Dr. Adams, in the Dublin Hospital Reports, in which no pulsation could be felt, in any part of the body, and even the heart offered no other sign of action than a slight undulating sound. Upon dissection, in this case, even the coronary arteries were observed to be ossified, and their cavity quite obliterated for some distance near their origin. The old are much more liable to be affected than the young or middle-aged, and men than women. No age, however, is quite exempt, and the affection has been observed even in infancy.

The deposition generally takes place between the middle and inner coats, though the earthy phosphate is asserted to have been observed in the substance of both of these coats, especially of the former. At first, it occurs here and there, and often at distant points, in small plates or scales, which increase in number, and at length coalesce, forming patches of considerable extent, and sometimes complete bony tubes. The plates are sometimes marked by the annular fibres of the middle coat, with which they are in contact.

Causes.—Ossification of the arteries has been ascribed to chronic inflammation, but altogether without proof. If marks of inflammation have sometimes been observed in the ossified vessel, they have more frequently been quite wanting, and, when present, have much more probably been the result than the cause of the change of structure. It is not impossible that inflammation may sometimes determine a deposition of calcareous matter; but it is not the ordinary or necessary cause. Dr. Hope thinks that over-distension of the arteries produces a condition favourable to this species of degeneration, and adduces the following among other reasons; that the affection is most common when the left ventricle of the heart is hypertrophied, that it is more frequent in men than in women, who are less exposed to severe muscular exertion, and that it is most apt to attack the vessels most liable to distension, as the arch of the aorta, and the arteries of the brain. (*Cyc. of Pract. Med.*, article *Arteritis.*) It is probable that gout and rheumatism may favour calcareous depositions in the arteries, as in other parts of the body. In this case, the result is to be ascribed rather to vitiation of the blood than to vascular irritation Old age strongly predisposes to the affection. It is, indeed, so common in old persons, that total exemption is comparatively rare, and the inference might also be drawn, that it is one of the normal results of advanced life. Mr. Crisp has seen elevated soft patches on the coats of the arteries, some of which were advancing to the cartilaginous state with a little ossific deposition, others were half ossified; and he believes that ossification is in general the mere termination of the atheromatous and cartilaginous lesions. (*Treat. on Struct., Dis., &c. of the Blood-vessels*, p. 72.) Hasse, however, denies that the cartilaginous patches ossify.

Effects.—Ossification produces inequalities in the inner surface of the artery, and thus exposes particular points to an increased impulse from the current of the blood. The lining membrane, previously weakened by inflammation, or thinned by absorption, is readily ruptured. The middle coat is at the same time attenuated and enfeebled, from the pressure of the increasing deposition, and in its turn also gives way. The foundation is thus laid for aneurism. Sometimes the whole of the coats are ruptured, and fatal hemorrhage ensues. This is especially apt to happen in the arteries of the brain, from their want of the cellular coat, and the yielding medium in which they are embedded. Inflammation and ulceration of the artery sometimes result from the presence of the foreign matter within its coats; and the consequent exudation of fibrin, or coagulation of the blood, produces a complete obstruction of the vessel. Hence atrophy or mortification of the parts which depend on the vessel for their blood. Gangrene of the extremities in old people sometimes arises from this cause. The ossified arteries, moreover, can no longer perform their part in the circulation; and may thus possibly contribute to the failing nutrition, and general decay of old age. Atrophy and consequent feebleness of the brain and of the heart have sometimes appeared to result from ossification of their vessels. Another injurious effect is an increased risk from surgical operations and accidental violence.

There is no known remedy for ossification of the arteries; and our efforts must be confined to measures calculated to obviate its causes, and, as far as possible, its injurious effects. To prevent undue excitement of the heart, and unnecessary stress upon the vessels, are the chief indications; to answer which, mental equanimity, abstinence from stimulants, and the avoidance of strong muscular exertion are the means most worthy of reliance.

Article III.

ANEURISM.

By the term aneurism, as here employed, is meant a tumour containing blood, and formed by the expansion of one or more of the coats of an artery. Scarpa made a distinction between dilatation and aneurism, applying the former name to an expansion of the whole of the arterial coats for a limited extent, the latter, to an expansion of the exterior coat, occurring in consequence of a solution of continuity in the inner and middle. In relation to cases in which the entire circumference of the vessel is dilated, there is some ground for the distinction; as certain phenomena characteristic of ordinary aneurismal tumours are wanting in these. But, when the dilatation affects only a portion of the circumference, tumours are formed in no respect distinguishable, during life, from other aneurisms. Besides, in the progress of dilatation, the inner and middle coats not unfrequently undergo a solution of continuity, so that an identity of character is given to the two affections. So close a connection, therefore, exists between dilatation and aneurism, that they may be properly considered under one head. The following remarks apply particularly to internal aneurisms, which, from their position, are beyond the reach of surgical aid.* The varieties which have been recognized are 1. *complete dilatation;* 2. *partial dilatation;* 3. *sacculated expansion of the outer coat with solution of continuity in the two inner;* 4. *dissecting aneurisms,* in which the blood separates the coats; and 5. *hernial aneurism,* in which the interior coat protrudes through an opening in the middle.

1. *Complete Dilatation.*—In this affection, the whole circumference of the artery is expanded equably, or nearly so, and occasionally for a considerable extent. Sometimes the expansion is greatest at a certain point of the vessel, and gradually diminishes in both directions, so as to form a *spindle-shaped* or *ovoidal* tumour; and a number of fresh tumours may occur successively

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* The internal aneurisms bear a large proportion to the whole number. Of 551 cases compared by Mr. Crisp, 288 were of that character, not including those of the carotids and external iliacs. (*Treat. on Struc., Dis., &c. of the Blood-vessels,* p. 118.)

along the same vessel. In other cases, the dilatation is equable in the longitudinal direction, and consequently has a *cylindrical* shape. Again, the artery may be lengthened, as well as expanded, thus becoming somewhat tortuous, like a varicose vein; and the term *aneurismal varix* has been applied to this affection. In dilatation of the artery, the coats sometimes become thinner than in health; but, in most cases, they either retain their original or acquire an increased thickness. They are almost always changed in structure; becoming denser, more opaque, and less elastic, or exhibiting some of those morbid depositions noticed under *Arteritis* and *Ossification*, with a rough, fragile, or softened state of the lining membrane.

Hasse states that, in every instance which has come under his notice, including as well partial as complete dilatation, the inner surface was covered with semi-cartilaginous patches and false membranes, rendered uneven, softened, or partially exulcerated by atheromatous deposits, and extensively ossified. (*Anatom. Descrip., &c.*, p. 85.) The internal and middle coats are sometimes completely or almost completely destroyed, and their place supplied by these morbid deposits, which, however, may present the appearance of the natural coats, of which the middle is represented by the atheromatous matter, and the inner by the cartilaginous patches, and a delicate, smooth, semi-transparent, false membrane. (*Ibid.*, p. 86.)

The predisposing cause of dilatation is probably almost always this altered, inelastic condition of the coats, which disables them, when expanded under the heart's impulse, from returning to their former dimensions when the impulse ceases. Whatever tends to accelerate or give increased force to the movement of the blood may prove an exciting cause. Hypertrophy of the left ventricle favours the production of the disease. Vicinity to the heart must have the same effect, as the greatest force is there applied to the blood-vessels. Hence, dilatation is most frequent in the ascending portion and arch of the aorta. It is sometimes, however, found in the larger branches of this trunk, especially those which go off at right angles, and even in the smaller and more distant vessels. It has been met with, though rarely, in the pulmonary artery. The aorta is often dilated to twice its ordinary caliber, and occasionally much more. Very large dilatations sometimes present lesser bulgings upon their surface.

One of the points in which these dilatations most strikingly differ from the ordinary forms of aneurism, is the want of coagula. The surface is too uniform to impede the movement of the blood, and thus favour its concretion. In some instances, however, when the inner membrane happens to be ulcerated, rent, or otherwise irregular, the blood coagulates upon its surface, forming layers which more or less completely fill the cavity.

While the dilatation is small, it produces no observable effect upon neighbouring organs; but, when much increased, it may give rise to phenomena of compression, such as result from other aneurismal tumours. Sometimes the two inner coats lose their continuity from fissure, ulceration, or other cause, and the dilatation is converted into a proper aneurism. When the dilatation is considerable, it has been thought to occasion enlargement of the heart, which complicates the phenomena, and increases the danger.

2. *Partial Dilatation.*—Sometimes that condition of the coats which causes an artery to yield to the force of the circulation is confined to a portion of its circumference, which is consequently the only part dilated. A tumour is thus formed upon the side of the vessel, with which it communicates by an abrupt orifice, usually narrower than the body of the pouch. Such tumours have been repeatedly observed with all the coats of the artery apparently entire; but there is reason to believe that a smooth, false membrane, often found lining the aneurismal sac, has been mistaken, sometimes at least, for the proper inner tunic. They are sometimes denominated *true aneurisms*, to distinguish

them from the following variety, to which, however, as by far the most frequent, the name would seem more appropriately to belong. The blood finds an easy entrance into and exit from these tumours, but, being somewhat impeded in its passage, is more apt to coagulate than in the preceding form of dilatation. The coagula, however, do not generally adhere to the whole interior surface, forming concentric layers, as in the next variety; but appear to be attached by a kind of peduncle to certain parts of the surface, which, from being ulcerated, fissured, or otherwise roughened, entangle portions of the blood as it passes over them, and favour its coagulation.

These partial dilatations are most frequent in the ascending portion and arch of the aorta, though found in other parts of this trunk, and occasionally also in its branches. They arise usually from the anterior or lateral portion of the aorta, where the vessel is least supported. They are much less frequent than dilatations affecting the whole circumference. They sometimes attain a great magnitude; but, in this case, the inner and middle coats are generally ruptured, the expansive force is directed against the outer or cellular coat, and an aneurism of the following variety is engrafted upon the original dilatation. The affection thus complicated is called by some a *mixed aneurism*. In positions where the exterior coat is wanting, the artery bursts without previously forming this kind of tumour. Such is the case with dilatation of the aorta occurring near its origin, where, instead of the usual exterior coat, the vessel is invested with the pericardium. This, being less extensible than the ordinary cellular coating, gives way before the expanding force, and the blood escapes into the pericardial cavity.

3. *Aneurism from Rupture of the Inner and Middle Coats.*—This is by far the most frequent form of aneurism, and the one considered by Scarpa as especially entitled to the name. By many writers it is called *false aneurism*, in contradistinction to tumours arising from partial dilatation, which have been called *true aneurisms*. In this variety, the interior and middle coats, either from absorption, ulceration, or rupture, give way at some point; and the blood, passing through the opening, presses directly upon the cellular or outer coat, which, being tougher and more expansible, yields to the pressure, and forms a pouch or sac on the side of the artery. The orifice is of various shape and dimensions, but its diameter is generally less than that of the sac. It is not always in the middle of the tumour. The caliber of the artery is almost always diminished below the orifice. The tumour gradually increases with the continuance of the distending force. Its walls, instead of being rendered thinner by the distension, take on increased nutritive activity, and become thicker, denser, and more resistant, so as sometimes to be fibrous, or even fibro-cartilaginous. The tissues pressed upon by the tumour are either absorbed, or stretched over its parietes, with which they are sometimes incorporated, giving them increased thickness and strength. No structure has been found permanently to resist its progress. Even bone gradually yields, being absorbed, or worn away by the attrition of the blood, which, in consequence of the absorption of the periosteum, and the adhesion of the sac to the circumference of the denuded portion of the bone, sometimes plays directly upon its surface. The periosteum is sometimes absorbed, sometimes incorporated with the walls of the sac. In the latter case, it is said to secrete earthy matter, which serves to increase the strength as well as the bulk of this morbid structure. The viscera of the chest and abdomen, as the heart, lungs, stomach, liver, &c., are frequently forced out of their place by the augmenting tumour, or undergo a partial absorption to make room for it. Cartilage opposes the greatest resistance, being little if at all affected; and portions of this tissue occasionally remain, after the bones to which they were attached have disappeared. The tumour at length frequently approaches the surface,

and becomes obvious to inspection. In the mean time, changes have been going forward in the interior of the sac. Almost from its commencement, the blood in contact with its rough internal surface coagulates, and successive fibrinous layers are formed, which are disposed concentrically, and often fill up a large portion of the cavity. It is probable that inflammation of the surface of the sac favours this tendency to fibrinous deposition. The layers have been found to be light-coloured, and dense in proportion to their vicinity to the wall of the tumour; those nearest it being whitish or yellowish and firm, while the coagula near the centre are soft and blackish-red. The thickness of these layers is commonly from half an inch to an inch and a half, but it has been known to be three and even five inches. Sometimes the coagula, instead of being firm, are remarkably soft and fragile, owing probably to the peculiar state of the blood. In the progress of the aneurism, some portion of its covering, in consequence of a greater pressure from within or without, or from some peculiarity in its structure, is absorbed; and the tissue beyond it, previously condensed by adhesive inflammation, supplies its place for a time. This is in its turn absorbed, and thus the sac advances until it reaches the skin or the lining membrane of some cavity, when an opening is effected, and the blood escapes. This happens somewhat differently in the different tissues. When only the skin intervenes between the contents of the sac and the external air, the most prominent part assumes a bluish or purplish colour, and at length sloughs. As soon as the dead portion begins to separate, an oozing of blood takes place; and a more complete separation is often followed by a tremendous gush, which nothing can control, and which sometimes produces death almost instantaneously. The first portions of blood discharged are accompanied with dark and broken coagula from the sac. The opening of the aneurism into the mucous cavities is effected in the same manner. But when it approaches one of the serous membranes, this is thought to be mechanically ruptured by the distending force, without previous mortification. Hasse, however, believes that the opening is in this, as in the other cases, a vital process. Instead of pursuing the course mentioned, the blood is sometimes effused, through an opening in the sac, into the areolar tissue, not previously consolidated by inflammation, and then spreads to a considerable distance through this tissue, forming a diffused tumour.

Aneurisms of the descending aorta, and of the smaller arteries, are generally of the kind above described. They are said sometimes to originate in a different mode from the one pointed out. Corvisart met with encysted tumours beneath the outer coat of the artery, attended with a destruction of the two inner coats. These he supposed might be converted into aneurisms by the softening and discharge of their contents, and the entrance of the blood into the empty cysts; and such cysts have been subsequently seen by M. Bérard, already opened and communicating with the aorta. (*Dict. de Méd.*, iii. 15.) Hodgson, however, maintains that these tumours were the remains of cured aneurisms, instead of the origin of new ones.

4. *Dissecting Aneurisms.*—This name was given by Laennec to a form of aneurism, in which the blood, having passed through an opening in the interior and middle coats, afterwards, instead of forming a prominent tumour by the distension of the outer coat, diffuses itself between this and the middle, along the course of the artery. Sometimes the blood re-enters the vessel by another opening; and the portion of artery, intervening between the points of exit and re-entrance, may become obliterated. Several cases of this kind of aneurism are recorded by Dr. Pennock, in his edition of Dr. Hope's *Treatise on Diseases of the Heart* (Am. ed., A. D. 1842, p. 402). In one of these, under the care of Drs. Pennock and Goddard, the dissection of the aorta by effused blood extended around nearly its whole circumference, and throughout its

length, beginning near the semilunar valves, and terminating in a *cul-de-sac* at the bifurcation into the primitive iliacs; so that the aorta appeared like a double artery, one tube being enclosed within the other. From an examination of this and other pathological specimens, and from the fact, ascertained by experiment, that the middle coat of the aorta consists of layers less firmly connected together than the outer coat is with the surface of the middle, Dr. Pennock was led to the conclusion, that, in dissecting aneurisms of considerable extent, the blood will be found not between the middle and exterior coats, but between the laminæ of the middle coat. This explains the otherwise not readily explicable phenomenon, that the outer coat, usually so readily extensible, resists in these cases the force of the circulation, and confines the blood to the course of the artery. It is aided by the greater firmness and elasticity of one of the laminæ of the middle coat.

5. Some cases are on record of another variety of aneurism, in which the middle or fibrous coat is ruptured, while the inner one remains entire. The latter is forced by the blood through the opening in the former, and thus produces a sort of aneurismal hernia. Such cases are very rare; nor can the tumour ever attain a great magnitude without rupturing the inner coat, and thus being converted into the common aneurism of the third variety. Instances have occurred of another kind of aneurismal hernia, in which the cellular coat has given way, and the inner and middle coats project.

Effects of Aneurisms.—From all the varieties of aneurismal tumours the most serious consequences usually result. By pressure on the neighbouring organs, they materially derange their functions, and not unfrequently occasion organic changes of a dangerous and even fatal character. Not only does the organ immediately compressed suffer, but also distant parts and functions, which depend for their due condition upon the healthy state of that organ. As examples of these effects may be adduced, pressure upon the air-passages, producing dyspnœa; upon the œsophagus, dysphagia; upon the heart, displacement of that organ and great disorder in its actions; upon the lungs, congestion, inflammation, pulmonary hemorrhage, and oppressed breathing; upon the arteries, obliteration of their cavities and consequent atrophy or gangrene in the dependent parts; upon the great venous trunks, venous congestion, œdema of the face and limbs, and, when the descending cava is compressed, congestion of the brain and even apoplexy; upon the thoracic duct, general atrophy and œdema; and upon the nervous centres or the nerves themselves, the most excruciating pains, innumerable disorders of sensation, motion, and other functions, and sometimes paralysis. In the abdomen, the functions of the stomach, bowels, liver, and urinary apparatus are in different cases very seriously interfered with. The bones affected are chiefly the sternum, ribs, clavicle, vertebræ, and scapula. By absorption of the bony case of the spinal marrow, and consequent irritation of this nervous structure, the most intense disturbance has been created in various functions depending for their healthfulness upon its integrity. Patients are not unfrequently destroyed by complicated suffering, and various functional and organic derangement from these causes, before the tumour has opened.

Another effect, which aggravates the symptoms greatly, is a hypertrophied state of the left ventricle of the heart, which is a frequent attendant upon internal aneurisms, especially those of the ascending aorta and arch, being induced probably by the incessant stimulus extended to that organ by the embarrassed condition of the circulation.

When the patient escapes these dangers, he is exposed to the utmost hazard from the rupture of the sac into one of the internal cavities. This sometimes takes place at a comparatively early stage, before the aneurism has become so far developed as to call attention to its existence. The first intimation of the disease is occasionally that afforded by dissection. The sac may open into the trachea or bronchia, producing copious hæmoptysis, or overwhelming the lungs; into the œsophagus, giving rise to hæmatemesis; into other arteries, the veins, or even one of the cavities of the heart, causing great derangement of the circulation;* into the posterior mediastinum, and the pleural or pericardial cavities, fatally oppressing respiration and the action of the heart. In the abdomen, it may open into the peritoneal cavity, the stomach, intestines, or bladder. In most of these cases there is a twofold danger, that of suspension of one of the vital functions from the pressure of the effused blood, and that of exhaustion from its loss.

A singular mode of fatal termination of an aneurism of the aorta recently occurred to myself in a patient in the Pennsylvania Hospital. A large collection of pus had formed in the aneurismal sac, which was discharged into the trachea, suffocating the patient, without any hemorrhage, which was prevented by the adhesion to the walls of the sac of the coagulum by which it was filled, below the abscess. (See, for a report of this case, the *Am. Journ. Med. Sci.*, July, 1858, p. 94.)

Finally, should death result in neither of these modes, the tumour ultimately reaches the surface, and terminates life by external hemorrhage. The bleeding, whether internal or external, after the opening of the sac, is not always so copious as might have been anticipated. Sometimes it is restrained by the smallness of the cavity into which the blood escapes, sometimes by the narrowness of the opening, and adhesions formed around it, and sometimes by the fibrinous depositions and coagula contained in the sac itself. The duration of the disease is very various. It may last only a few weeks or months, or may continue many years; and not unfrequently patients die of other diseases during the progress of this.

Notwithstanding these numerous dangers from internal aneurism, it is not necessarily fatal. Cases of cure have been recorded; and the affection sometimes terminates favourably without aid. Spontaneous cures take place in various modes. Sometimes the sac is completely filled by the deposited fibrin and coagula, and, being no longer distended by the blood entering it, gradually contracts, undergoes absorption, and terminates at length in a small fleshy tumour attached to the artery; the caliber of the vessel being usually obliterated if small, but remaining pervious if large, especially in the aorta. It is said that, even in dilatation, layers of coagulated blood, concentrically arranged, sometimes fill up the expansion, leaving a smooth canal in the middle, of the size of the arterial caliber. Another possible mode of termination, though, in relation to internal aneurism, it must be very rare, is the obliteration of the artery above the orifice of the sac, by the pressure of the tumour upon it. Finally, inflammation or gangrene may come on in the sac, attended with exudation of fibrin and coagulation of blood so as to obliterate the artery; and the patient may ultimately recover, provided the parts below the tumour can be sufficiently supplied with blood by the anastomosing vessels, and provided also there be sufficient vigour of constitution to sustain the long and exhausting processes of inflammation, sloughing, suppuration, granulation, &c., through which the diseased parts must pass in their return to health.

Causes.—A diseased condition of the arteries is probably essential to the production of aneurism. It is doubtful whether any amount of force which the heart is capable of exerting, or any degree of mechanical injury, could directly induce aneurism such as we have described it, in an artery previously in perfect health. The inner or middle coat, or both coats, may be ruptured; but, if the vessel is quite sound, there is reason to believe that coagulable lymph will be thrown out, and the injury repaired. The true causes of aneurism, therefore, are such as induce a morbid state of the arteries; whether this consists in an altered condition of their proper tissue, or the deposition of new substances upon or within their coats, such as atheromatous, cartilaginous, calcareous, or tuberculous matter. These causes and their results have been already sufficiently considered under arteritis, and ossification of the arteries. Syphilis has been supposed to occasion a softness of the arteries, and ulceration of their inner coat, favourable to the production of aneurism. The same may probably be said, with even more truth, of habitual intemperance, at least so far as concerns its effect upon the cohesion of the vascular tissue. There appears to be some affinity between aneurism and cancer. The aneurismal diathesis is seldom overcome. When one tumour disappears, another is apt to form in the same or a distant artery. The aspect of the patient, moreover, is frequently analogous to that so commonly observed in cancerous disease. (Rokitansky, quoted by Hasse, *Anat. Descript.*, p. 95.)

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* Cases are on record in which aneurisms have opened into the right ventricle and right auricle, and into the pulmonary artery.

When the arteries are thus diseased, even the ordinary force of the circulation may bring on aneurism; but whatever increases this force, whether habitual or accidental, will hasten the occurrence of the affection, and render its progress more rapid. Hence, hypertrophy of the heart, the use of stimulants, and all excessive excitement, whether mental or bodily, may rank among the exciting causes. Tight lacing may have the same effect by producing irregularity in the caliber of the vessels, and exposing certain parts to greater distension than others. External violence, and especially such as occasions a sudden elongation of the artery, would be apt to rupture the coats already diseased, and thus bring on an immediate attack. Some of these causes act doubly, both as predisposing and exciting. Thus, a constant over-distension of the vessels by excessive action of the heart, may induce, in the end, either through an exhaustion of their excitability, or the production of chronic arteritis, a state of their coats favourable to aneurism, while it may directly bring on the complaint after the predisposition has been established. This view is confirmed by the statement of Dr. W. S. Kirkes, made after a comparison of very many cases of disordered heart and arteries, that hypertrophy of the left ventricle, without enlargement of the valves, is very generally attended with disease of the aorta. (*Med. Times and Gaz.*, Aug. 1857, pp. 110 and 135.) The position of the artery is not without influence in relation to its liability to aneurism. Vessels near the heart, or most exposed from their shape to the force of the current of blood, or from their position to external violence, are most apt to be affected. Men are much more liable than women, because more exposed to violence, over-exertion, intemperance, and other causes. Mr. Crisp states that, upon a comparison of upwards of 500 cases, he found the proportion of females rather less than one-eighth. The disease is very rare in infancy.

General Diagnosis.—When the disease has made its way externally, and appears in the form of a tumour upon the surface, it may generally be distinguished without difficulty. The tumour is usually roundish, with a greater prominence at one point; is soft and compressible, returning to its original shape upon the removal of the pressure; and pulsates under the finger, and sometimes visibly to the eye. Pulsation, synchronous with the action of the heart, is the most characteristic symptom of aneurismal tumours. It is of a somewhat peculiar quality, slow, expansive, and heaving, as if the whole tumour was enlarging under the hand. It may, moreover, be felt in all parts of the swelling. If the artery is compressed above the tumour, its bulk diminishes and the pulsation ceases; if below, the force of the pulsation is increased. Sometimes, however, from thickness of the walls of the sac, or the great quantity of coagulated blood contained in it, there is little or no pulsation, and the tumour scarcely yields to pressure. The same is to a certain extent the case when the blood has been effused into the areolar tissue. But, even in these cases, a careful examination will almost always detect pulsation in some part of the swelling, at one time if not at another; and, if the fingers fail, recourse may be had to the stethoscope, which will reveal the pulsation, and frequently also render sensible a rasping or bellows sound in the tumour. Swellings which are not aneurismal sometimes pulsate in consequence of being situated over an artery, or connected with it so as to be influenced by its movements. But, if they are solid, there can be little difficulty in distinguishing them. The pulsation is elevating instead of being expansive, and ceases if the tumour be separated from the artery by raising it. Nor will the tumour undergo any change by pressure on the artery between it and the heart. Collections of liquid diffused around an artery might occasion more difficulty in the discrimination. In such cases, a just inference may generally be drawn from the circumstances attending the origin and progress of the tumour. In relation to the signs of aneurism, while still confined within the great cavities, I shall treat under the head of aneurisms of these cavities respectively. It is sufficient here to say that none of the general symptoms are absolutely conclusive, unless the tumour can be felt; and certainty can be attained only through the medium of the physical signs afforded by auscultation and percussion.

Internal aneurisms occupy either the cavity of the cranium, that of the thorax, or that of the abdomen.* In relation to the first, little can be known of them during life, except conjecturally; and even for conjecture there is scarcely any plausible ground; for all the symptoms which they produce much more frequently arise from other causes. Dissection has occasionally revealed aneurismal enlargements, or more strictly dilatations of the carotid, vertebral, and basilar arteries; and death, with apoplectic symptoms, has resulted from their rupture. Indeed, from the deficiency of the cellular coat, they are peculiarly liable to rupture when dilated. Headache, vertigo, and tinnitus aurium are among the symptoms which precede the attack of apoplexy in which they terminate. Possibly, auscultation may yet succeed in penetrating these mysteries, and surgical aid may be brought to the rescue of the patient. Indeed a case has been recorded by Dr. Whitney, of Newton, Massachusetts, in which a harsh bellows murmur was perceived by applying the ear to the cranium, and an aneurism of the basilar artery was found upon dissection after death. (*Am. Journ. of Med. Sci.*, N. S., vi. 314.) Our attention here will be confined to the two other cavities.

Thoracic Aneurisms.

All the considerable arteries of the chest are liable to aneurismal disease in some one of its forms. So long as it is confined within the bony walls of the cavity, the diagnosis is often exceedingly obscure, and sometimes, with all the aid that modern skill can bring to the investigation, more or less uncertain. The general signs can scarcely ever be confidently relied on. They, nevertheless, assist materially towards the forming of a correct judgment, in connection with those afforded by physical exploration.

When the aneurism is not so large as injuriously to compress the neighbouring organs, it often escapes notice entirely, and, as before stated, may go on to fatal rupture without being suspected. Occasional dyspnœa, and vague feelings of pulsation or other irregular action in the chest, are insufficient to excite alarm. As it increases, however, and even almost from the commencement, in certain cases, it gives rise to various disorders of function, which, though perhaps few and slight at first, augment in number and degree, till they sometimes acquire a fearful intensity. The symptoms about to be enumerated never all occur together in the same case. Some cases are attended with one set of them, others by another, according to the situation and size of the tumour. Among the most common is a feeling of tightness, fulness, or oppression of the chest, resulting from the presence of a new body within a space already filled. Respiration is sometimes attended with a harsh, wheezing, hissing, or stridulous sound, proceeding from the chest; while the voice is hoarse, croaking, or whispering, owing to pressure upon one or more of the larger bronchial tubes or the trachea, or to irritation or injury of the recurrent nerve. The alteration of the voice is sometimes so striking, and the dyspnœa so great, that practitioners have supposed the larynx to be diseased, and have even performed tracheotomy. The absence, however, of pain upon pressure in the larynx, of swelling in the vicinity, and of redness of the fauces, taken in connection with the mode of attack, and the simultaneous and antecedent pectoral symptoms, will enable a just conclusion to be formed on this point; and still greater certainty may be obtained by means of the laryngoscope, which presents the glottis itself to the eye, and thus enables us to decide upon the nature of any disturbance in its functions. (See *Aphonia, vol.* i. *p.* 981.) Attention has of late years been called to contraction of the pupil, supposed to originate in pressure on the sympathetic nerve. Sometimes one pupil is contracted, sometimes both. Dr. Waters, of Liverpool, has seen it as a permanent symptom, more especially in aneurisms at the base of the neck. (*B. and F. Medico-chir. Rev.*, Oct. 1864, p. 506.) The breathing is often hurried and laborious, and sometimes attended with paroxysms of dyspnœa like those of spasmodic asthma. Cough in various degrees is very common, sometimes troublesome and even violent and convulsive, with hæmoptysis, or bloody expectoration. In consequence of pressure upon the bronchia, there is occasionally feebleness of respiration in one lung; and this is considered by Dr. Stokes, when not explicable by the presence of a foreign body in the air-passages, or other discoverable pectoral disease, as a sign of great importance. It may result from a small tumour insufficient to cause pulsation, dulness, or stridor in breathing. The above symptoms, with various others, as palpitations, disposition to syncope, pallid, livid, or purplish complexion, œdema of the face and limbs, swelling at the lower part of the neck, dropsy of the serous cavities, oppression of the brain, a varicose or distended state of the external veins of the chest, &c., arise partly from pulmonary congestion or inflammation excited by the tumour, partly from its pressure upon the venous or lymphatic trunks, but still more from disease of the heart, so frequent an attendant upon aneurism, and often one of its consequences. Congestion of the liver and whole portal circle, and of the brain amounting even to apoplexy, has resulted from compression of the ascending and descending vena cava. Another occasional symptom is greater or less difficulty in swallowing, and in the eructation of gases, resulting from compression of the œsophagus, which, without care, may lead to the notion of the existence of stricture in this tube, and the consequent use of the bougie or probang. I have had a case in which excessive dyspnœa was induced by every attempt to swallow food, owing, as was proved upon dissection, to an aneurismal tumour pressing immediately on the trachea in front of the œsophagus. Pain of various degrees and character is felt in the chest, sometimes vague and dull, sometimes acute, lancinating, and exceedingly severe, shooting, in different directions, from the middle of the cavity or from the back towards the diaphragm, neck, shoulders, and arms, especially the left arm, which is not unfrequently affected with formication, and partial loss of sensation and motion. The pressure upon the spinal column and brachial plexus is sufficient to account for these symptoms. Deep-seated and excruciating pains, of a boring character, attend the wearing action of aneurisms upon the spine.*

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* As to the relative frequency of these aneurisms, Mr. Crisp states that, of 288 cases, 175 were of the thoracic aorta, 2 of the pulmonary artery, 20 of the innominata, 23 of the subclavian, 59 of the abdominal aorta and its branches, 2 of the common iliac, and 7 of the cerebral arteries. (*Treat. on Struct., Dis., &c. of Blood-vessels*, p. 113.)

The pulse is frequently much deranged. When the aneurism intervenes between the heart and the arteries of the arm, the vibratory motion received by the blood in its passage must be extended more or less to the artery at the wrist. Hence the thrill so often observable in the pulse in aneurisms of the chest. The pulse at the wrist is often different on the different sides, and is sometimes quite wanting in one arm, in consequence of compression or obstruction of the innominata or left subclavian. From a degree of the same cause, the pulsation at one wrist has been observed, in some cases, to be considerably later than that of the heart. Dr. Billing has indicated a resilience of the pulse, depending on that of the aneurismal tumour, after each beat of the heart, as a means of detecting aneurism in its early stages; and Dr. Joy has suggested that the simultaneous presence of this character in the pulse of the upper and lower extremities, or its presence in the latter and absence in the former, might be an index of the position of the affection, in the one instance, near the origin or at the arch of the aorta, and in the other, at some point in the vessel below the origin of the left subclavian. Numerous other irregularities of the pulse frequently accompany aneurisms; but they depend more commonly on coexisting disease of the heart than on the arterial affection.

The attitude of the patient will assist in the diagnosis. In consequence of the necessity of alleviating by position, as much as possible, the pressure of the tumour upon the air-passages, he generally prefers some one posture, to which, though he may frequently change it from restlessness, he is always disposed to return. This is different in different cases. The most common attitude is that of sitting, with the head bent forward, or to one side. Some find greater ease on one side than the other, and some even incline the body backward. The necessity of giving free scope for expansion of the chest, in consequence of effusion, or other source of embarrassment to the respiration, is probably even a more cogent reason for the erect position.

Dulness on percussion over certain parts of the chest, especially the middle and upper, often exists in cases of thoracic aneurism, though, according to Dr. Hope, not unless the tumour is larger than an egg. Sometimes the outline of the tumour may be pretty accurately defined in this way.

If the hand be applied over the middle or upper part of the sternum, a vibratory thrill may sometimes be felt, similar to the motion of a purring cat; and the same sensation is produced above the clavicles. This purring tremor, as it is called, sometimes results from mucus in the bronchia; but, in this case, may be readily distinguished by ceasing when the patient holds his breath. It is more observable, according to Dr. Hope, in simple dilatation than in sacculated aneurism; and is ascribed by him to the asperities of the inner surface so common in the former affection.

But none of the foregoing phenomena is so characteristic as *pulsation*, distinct from that of the heart, and felt beneath the ribs or sternum at the upper part of the chest, or above the sternum and clavicles. In order that it may be sensible in the latter position, it may be necessary to press the fingers down as deeply as possible, with the head of the patient bent forward. By pressing with the palm of one hand anteriorly on the chest, and with that of the other posteriorly, and by making the examination at the end of a full expiration, the impulse may sometimes be felt, when it would otherwise escape notice. (*Stokes.*) In thoracic aneurisms the *impulse* is usually *double*, a fact which is, I think, best explained by Dr. R. D. Lyons, of Meath. That this result should take place, it is necessary, according to Dr. Lyons, that the aneurism should be sacculated. The wave of blood sent forth by the systole of the heart produces the first pulsation; the elastic contraction of the aorta which follows, and which is not participated in by the sac, produces the second. (*Dublin Quarterly Journ. of Med. Sci.*, ix. 344.) A throbbing of the aorta from mere functional disturbance, as from the irritation of gout, may be mistaken for a time for the aneurismal impulse; but its subsidence and ultimate disappearance under treatment would correct the error.

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* Many of the functional derangements produced by aneurisms of the aorta depend on the injury done by them to the pneumogastric nerves, which supply so many of the neighbouring organs with their essential nervous influence. Thus, filaments are distributed to the mucous membrane of the larynx, to which they impart its secreting property; the recurrent branch supplies the muscles of the larynx which regulate the movements of the glottis; while in the chest branches are sent to the cardiac and pulmonary ganglia; and in the abdomen, to the semilunar ganglia, the stomach, pancreas, liver, and supra-renal capsules. Of course, disturbance in the functions of all these organs may result from an aneurism, involving in its progress the trunk or branches of this important nerve. (*Note to the sixth edition.*)

Evidences of Auscultation.—The stethoscope renders the pulsation more sensible to the ear, and at the same time reveals a peculiar sound in the aneurismal tumour. This, as described by Dr. Hope, is a deep, hoarse, bellows murmur, more or less rasping or grating, of short duration, and with an abrupt commencement and termination; but the fact is, that it varies greatly in different cases, being sometimes closely similar to the first sound of the heart, sometimes very feeble, and not unfrequently wanting. When this sound is perceived at a distance from the heart, it affords presumptive evidence of the existence of an aneurism. But the diagnosis is still not without its difficulties. The sounds of a diseased heart, and, in some thoracic affections, those of the healthy state, are often to be heard over a considerable extent of the chest, and might be mistaken for the sounds of an aneurism. The difficulty is less when the aneurismal sound is single; but not unfrequently, these tumours, especially the thoracic, imitate the heart by offering a *double sound*, which tends to confuse the diagnosis. Dr. Hope, however, has suggested considerations which diminish, if they do not remove the difficulty. The aneurismal murmur is generally different from the first normal sound of the heart with which it is synchronous, and even from the murmurs produced by valvular disease of that organ. These are usually not so loud as the aneurismal sound, are less hollow and more prolonged, and have a gradual rise and fall, instead of the abruptness of the latter. The depth and hollowness of the aneurismal murmur are usually greater above the clavicles than below. If the sound is traced in a direction from its origin towards the apex of the heart, it is found gradually to diminish, and, at the distance of an inch from the apex, either to have ceased entirely, or to be feeble and remote; while the sound of the heart is loudest at that point, and diminishes as you recede from it. This remark is true both of the healthy sound of the heart, and of the morbid sound or murmur proceeding from regurgitation through the auricular valves. In relation to the murmur arising from obstruction at the semilunar valves, there is great difficulty. This murmur is propagated two inches or more along the aorta or pulmonary artery; but it has been shown that, if louder and on a higher key, at this distance from the origin of the vessel, than opposite to the semilunar valves, the sound is owing to dilatation, aneurism, or roughness in the inner surface of the vessel; and if, supposing a tumour to exist at the side of the sternum, the murmur should be loud and distinct on the outer or humeral side of the tumour, the inference is justifiable that it is aneurismal; for the semilunar murmur is very feeble or quite inaudible at so great a distance from the course of the artery. When the first sound of the aneurism can thus be distinguished from that of the heart, the absence or presence of the second is of little importance.

The first aneurismal sound is ascribable to the friction of the blood, transmitted from the heart, against the orifice and sides of the sac. There has been considerable difference of opinion in relation to the cause of the second sound. Sometimes it has been thought to be a murmur from the semilunar valves propagated along the column of blood in the artery, in which case it could be traced back with a progressive increase of intensity to its origin. In other instances, it has been ascribed to a regurgitation of blood from the aneurismal tumour during the diastole of the ventricle. In this case, it would be distinguishable from the valvular murmur by its brevity, and by not being audible down the course of the ventricles; and would add to the evidence of the existence of an aneurism. Dr. Bellingham ascribes it to the regurgitation into the aneurism of the blood from the aorta and great vessels putting off from it. There can be no doubt that it proceeds from the same movement which produces the second impulse; and, consequently, Dr. Lyons' explanation is that which seems to the author most satisfactory; namely, that the two sounds are owing, the first to the systole of the heart, the second to the contraction of the aorta following its expansion, each movement driving blood into the sac.

The aneurismal sound, though when distinct it has generally somewhat of the character above assigned it, is sometimes softer and sometimes harsher, and varies also in its pitch. In old aneurisms, with thick walls, and filled with fibrinous deposit, the sound is remote and dull.*

Both the aneurismal murmur and the purring tremor are said to be stronger, when the blood-vessels are imperfectly filled, or contain a watery blood, than when in their healthy state in these respects. Hence they should be more observable in aortic regurgitation and anæmia.

Another auscultatory sign of aneurism is a bronchial sound in respiration, heard sometimes at a considerable distance from the course of the aorta, on both sides of the chest, arising from narrowing of the trachea by the pressure of the tumour; and to a similar cause may be ascribed a certain harsh sonorous inspiration heard in different parts of the chest. When these phenomena are observed, and can be traced to no other cause, they may be very probably referred to a tumour pressing upon the trachea; whether aneurismal or not must be determined by other considerations. In a case which occurred to me, the bronchial sound referred to, and a slight dulness on percussion, were the only signs of an aneurism, proved to be such by examination after death. In a considerable proportion of cases, the physical signs are quite wanting, and the physician is thrown upon the general symptoms for a doubtful diagnosis.

Dr. J. W. Begbie, of Edinburgh, considers an accentuated or "booming" second sound of the heart, when not dependent on hypertrophy and dilatation of the left ventricle, as indicative of aneurism of the aorta, or dilatation of the same vessel associated with atheromatous degeneration. If it be aneurism that exists, it does not originate within the pericardium; as, in this case, there is almost always insufficiency of the aortic valves, and a diastolic murmur in place of the second sound. (*Edin. Med. Journ.*, June, 1863, p. 1070.)

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* Some interesting observations have been made by Dr. Bellingham in relation to the sounds of aneurism of the arch of the aorta, for an abstract of which the reader is referred to the Am. Journ. of Med. Sci., N. S., xvi. 442. The more important inferences of Dr. Bellingham are, that aneurisms of the *arch of the aorta* are characterized by a *double sound*, which closely resembles the double sound of the heart; that either of these sounds or both may be replaced by a murmur, which may be either blowing, sawing, or filing in character, according to the condition of the surface in contact with which the blood flows; and that the first sound is thus much more frequently superseded than the second, because of the greater force with which the blood is transmitted. All the sounds arise from friction of the blood against the orifice or walls of the sac, and the murmurs differ from the proper aneurismal sounds only from the roughness of the surface increasing the friction. It certainly seems to have been shown that Dr. Hope attaches too much importance, so far as aneurisms of the arch of the aorta are concerned, to the peculiar character of the murmur.

Aneurisms of the Aorta.—The aorta is by far the most frequent seat of thoracic aneurism, and the part of this vessel oftenest affected is the arch and the upper portion generally. Near the origin of the vessel, where it is covered with the pericardium, the disease is very rare. The investing membrane is too firm to be distended under the pressure of the blood, and if the two inner membranes are ruptured, instead of dilating, it usually bursts and the blood is poured into the cavity of the pericardium. A very few cases of sacculated aneurism have been observed in this part of the artery. They are said to have a tendency to expand towards the heart, and the sac has been observed, in some instances, to be actually embedded in its parietes.

When the disease occupies the ascending portion, or the arch, pulsation is felt above the sternal ends of the clavicle, on both sides simultaneously. If the ascending portion exclusively is affected, though felt on both sides, the pulsation is stronger on the right. If the disease is a simple dilatation, affecting the whole circumference, the pulsation is not felt upon the sternum or ribs, unless the distension is very great. The purring tremor is sensible above the clavicles and not below. A hoarse aneurismal murmur synchronous with the pulse is also perceived above the clavicles. It is said to be louder than in sacculated aneurism. If the dilatation affects the ascending portion, the sound is louder above the right than the left clavicle, is perceptible along the course of the vessel up the sternum, is of a superficial and hissing or whizzing character, and is usually distinctly audible in the back. Dr. Pennock says that percussion yields a dull sound to a greater extent than in health, along the margin and over the upper third of the sternum, provided emphysema of the lungs does not exist in the vicinity. (Am. ed. of *Hope on Dis. of the Heart*, p. 426.) General dilatation is usually distinguishable, according to Dr. Lyons, from the sacculated forms of aneurism by the absence of the double murmur.

Anæmia is sometimes attended with pulsation and a bellows murmur above the clavicle; but the impulse is feeble, and the murmur much lighter than in dilatation, and the purring tremor is feeble or wanting. The absence of dulness on percussion in pure anæmia, and the existence of the venous musical murmur would be further diagnostic signs. *Aortic* regurgitation, according to Dr. Hope, is often also attended with similar phenomena above the clavicles; but the impulse is more jerking, and the sound not so hoarse as in dilatation; and, besides, there are signs by which this derangement may be discovered if attention be directed to the heart.

In sacculated aneurism of the upper portion of the aorta, pulsation is felt on both sides above the clavicle, and generally in a still greater degree below. If the disease is seated in the ascending portion, the pulsation is strongest on the right side; if in the beginning or middle of the arch, it is strongest above and below the right clavicle and about the top of the sternum, with some tumefaction in the same neighbourhood; if at the commencement of the descent, both the pulsation and tumefaction are most observable upon the left, and sometimes extend even to the shoulder. In every case, the pulsation will be found to be stronger over the aneurismal tumour than at a point between it and the heart. Sometimes it is so strong as to produce a perceptible heaving of the walls of the chest. The sound upon auscultation is of the same general character as in dilatation, but usually weaker and less rasping. In old aneurisms filled with coagula, the sound is dull and remote, and sometimes loudest on the side of the neck opposite to that on which the tumour is situated. The sound may also be heard in the back. The purring tremor above the clavicles is weaker than in dilatation, and in old aneurisms is often wanting. Deficiency in the respiratory murmur, and in resonance upon percussion, is present in proportion to the magnitude of the tumour. When the aneurism is seated in the descending portion of the aorta, the pulsation is not felt in front, but along the spine, especially on the left side, where the aneurismal murmur is also to be heard, and more loudly than upon the anterior part of the chest. If a sound can be detected along the spine, more abrupt and rasping than that of the heart in front, it is almost a certain proof of the existence of an aneurism. Occasionally, however, both the pulsation and sound in the back are wanting; and the diagnosis becomes very difficult. In this case, if the tumour is seated behind the heart, it is said by Dr. Hope to occasion in that organ a double impulse, corresponding with the diastole and the systole, and described as of a *jogging* character, which results from two other causes only, adhesion of the pericardium and displacement of the heart to the front of the spine. It is only, however, the existence of a tumour that is thus indicated, and upon other grounds must be based the decision as to its aneurismal character. In relation to sacculated aneurisms of the aorta, it must be borne in mind that various tumours occasionally exist in the chest, to which pulsation is imparted by the vicinity of the great vessels. But, in these cases, the aneurismal sound is not perceived, or only in a slight degree, and no pulsation or thrill is to be felt above the clavicle. When the heart is pressed out of its proper position by collections of pus or serum in the pleural cavities, the existence of pulsation in an unusual spot may lead to the suspicion of aneurism. But if, under these circumstances, the pulsation of the heart should be found wanting in the normal position, the difficulty is at once solved.

Aneurisms of the *innominata*, *subclavian*, and root of the *carotid*, when very large, are sometimes scarcely to be distinguished from those of the aorta. In relation, however, to the two latter arteries, there is a ground of diagnosis in the fact, that the pulsation, aneurismal murmur, and tremor above the clavicle are usually confined to the affected side, and are more superficial and distinct than in aneurisms of the arch of the aorta. Dr. Hope compares the murmur of a subclavian or carotid aneurism to the sound of a small hand-bellows, while that of an aneurism of the aorta bears a greater resemblance to the blast of a forge-bellows.[*]

Dilatation of the pulmonary artery is characterized, according to Dr. Hope, by pulsation and tremor between the cartilages of the second and third ribs of the left side, perceptible in a decreasing degree downwards, but wholly wanting above the clavicle; by a slight prominence between these ribs; and by a very loud, superficial, harsh, sawing sound above the clavicles, and over the whole precordial region, but loudest upon the prominence between the two ribs mentioned.

When aneurisms make their way out of the thoracic cavity so as to form tumours upon the surface of the body, they appear in positions corresponding in some measure with the portion of the artery from which they proceed.

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[*] Dr. T. S. Holland, of Cork, Ireland, gives the following as the diagnostic signs of aneurism of the innominata, compared with aneurism of the transverse part of the arch of the aorta, with which it may most easily be confounded. They were derived from an analysis of twenty-four cases of the former affection. In aneurism of the innominata, external tumour is more frequent, earlier, and situated above the inner third of the right clavicle, while in that of the transverse arch it is to the left of the sternum or behind it. In the former, the arteries of the right arm and right side of the neck pulsate more feebly than those of the left; in the latter, the case is reversed. The various affections of the voice, breathing, cough, and deglutition, so common in the aortic aneurism, are comparatively rare in that of the innominata. In the latter, pain, œdema, and venous enlargement begin on the right side of the arm and head; in the former, on the left. Partial paralysis of the right arm, and dislocation of the clavicle, trachea, or larynx, are frequent in the innominata, and rare in the aortic affection. Alteration in the intensity of the respiratory murmur, so common in the latter, is rare in the former. Murmurs in the right carotid and subclavian attend on the aneurism of the innominata, the pulsations of which are checked by pressure on those arteries: neither of which facts is true of that of the transverse arch. (*Dub. Quart. Journ. of Med. Sci.*, xiii. 296.)

Those of the ascending portion and bend of the aorta appear usually upon the right side of the chest and in front; those of the descending portion, upon the left side and behind. When the tumour appears on the right, at the level of the fifth and sixth ribs, it may be assumed to spring from near the origin of the aorta; when at the level of the third and fourth ribs, from the anterior part of the arch; when at the root of the neck behind the sternum, from the uppermost part of the arch. (*Chomel et Dalmas, Dict. de Méd.*)

Abdominal Aneurisms.

Not only the aorta, but all the other considerable arteries of the abdomen are liable to aneurism. These tumours have been found, for example, in the cœliac, hepatic, splenic, superior mesenteric, spermatic, and iliac arteries. The general signs of abdominal aneurism, like those of the chest, are such as arise from the disturbance of function and organization in the parts pressed on by the tumour. But, as the parietes of the abdomen are more distensible than those of the thorax, the organs have a greater opportunity of retiring before the pressure, and therefore suffer less, or at least longer without fatal results. Abdominal aneurisms produce disorder of the stomach and bowels, in the form of dyspepsia, vomiting, colic, constipation, flatulence, &c.; of the liver, in that of jaundice, and hepatitis; of the kidneys and bladder, in that of nephritic irritation and inflammation. By pressure upon the nerves which surround them, and on the spine in which they occasion caries or absorption, they sometimes give rise to a great diversity of deranged sensation and perverted function, and to the most acute abdominal and lumbar pains, which occasionally shoot downward into the testicle and lower extremities. These also sometimes suffer from spasm, and, with the bladder, are in various degrees paralyzed, in consequence of injury to the spinal marrow. The abdominal derangements from aneurisms are generally attended with less disturbance of circulation, less defect of appetite and nutrition, and less general loss of health, than would be expected from an equal amount of suffering and disordered function, from original disease of the viscera. But none of these are characteristic symptoms of aneurism. The latter must be looked for in the physical signs.

Perhaps the most distinctive sign of abdominal aortic aneurism is a strong expansive pulsation, much stronger under the stethoscope than the hand, felt over the surface of a fixed and compressible tumour, the outline of which may be traced, by means of the instrument pressed down upon it, extending beyond the line of the aorta. The pulsation is almost always single, though instances have been observed in which it was double. It is constant, and is felt as strongly laterally, or nearly so, as in the forward direction. If the tumour is very large, dulness on percussion will be obvious; and a brief, abrupt bellows sound, less loud and hoarse than that of thoracic aneurism, may often be heard over the course of the artery, in the front of the abdomen, and sometimes in the back. It is more perceptible below than above the tumour, because propagated downward by the course of the blood. It is sometimes wanting. To render it perceptible, when not so under ordinary circumstances, it has been recommended to examine the patient in the recumbent posture, with the abdomen elevated above the chest, so as to diminish the pressure of the blood in the abdominal vessels, and thus favour its entrance into and exit from the sac. Sometimes a small artery runs over the sac, and, if pressed on by the stethoscope, yields a murmur which might be mistaken for the aneurismal. It may, however, be easily distinguished by being more superficial, more hissing, confined to one spot, and entirely removable by pressing with the instrument so as to close the artery. Besides the above signs, another is afforded in the vibratory thrill which may sometimes be felt by pressing the hand firmly down over the surface of the tumour, and upon the vessel below.

In some instances, the tumour is restrained by the crura of the diaphragm, or by viscera beneath which it may lie, and which may have contracted adhesions so as to render them immovable. In such cases, it cannot be felt by the hand, and might yield no impulse. But, should general signs lead to the suspicion of its existence, it is possible that this evidence might be confirmed by the stethoscope applied along the spine. In cases of uncertainty in relation to the existence of a tumour, it has been suggested that, by placing one hand in front of the abdomen and the other on the back, and making pretty firm pressure, a tolerably correct inference might be drawn from the apparent thickness of the intervening space.

Tumours of various kinds existing in the abdomen, and receiving an impulse from some neighbouring artery, might sometimes without care be mistaken for aneurism. But the impulse is more feeble and less expansive, and is sometimes scarcely perceptible when the stethoscope is applied laterally, as may be done most conveniently by placing the patient on his side. If the tumour is displaced either laterally or anteriorly, the impulse will cease. The anterior displacement may be aided by causing the patient to support himself on his knees and elbows. Should the tumour, when removed from its position, still pulsate, the inference would be that it was an aneurism of one of the smaller arteries. The absence of aneurismal character might be inferred, if it were hard and quite incompressible. Such tumours by pressure upon an artery may occasion a bellows murmur; but it is much less perceptible than in aneurisms, and, if the tumour is displaced, or if the stethoscope is applied laterally, ceases with the impulse. Anemic pulsations of the aorta, as they are attended with the murmur, and are frequently associated with compressible tumours arising from air confined in some portion of the bowels, may occasion embarrassment in the diagnosis; and, should solid tumours coexist, they would receive a more than ordinary impulse from this cause. But attention to the condition of the system, and the existence of the anemic murmur elsewhere, would, independently of the different character of the sound, generally lead to a correct conclusion. The occasional removal and recurrence of the tumour, if dependent on flatulence, would satisfactorily disprove its aneurismal character. If the stethoscope be pressed, along the course of the artery, firmly upon the vessel, it will indicate an equable diameter in different parts of it, showing that no part was expanded. The pulsation, instead of being gradual, expansive, or heaving, as in aneurism, is quick and jerking, though sufficiently vigorous. In cases of abdominal tumours generally, the administration of brisk purgatives will sometimes settle the question by removing the source of difficulty, as in cases of impacted feces, concretions, flatulent collections, and masses of worms.

Sometimes the aneurism opens into the areolar tissue without the peritoneum, and pulsating tumours form in various positions, which may continue for a considerable time before the fatal termination. Such tumours appear in the iliac, hypochondriac, and lumbar regions. In other instances, the aneurism gradually makes its way in the ordinary manner to the surface, removing everything that opposes it, and, when presenting posteriorly, causing a partial destruction of the ribs and vertebræ. It sometimes attains an enormous size before bursting. An aneurismal sac has been known to originate near the upper boundary of the abdomen, and, after filling almost the whole cavity, to show itself beneath Poupart's ligament in the groin.

Aneurisms of the smaller abdominal arteries cannot always be accurately distinguished from those of the aorta. Inferences must be drawn from their position. When the tumour is readily movable, it may without hesitation be referred to one of the smaller vessels. Aneurisms of the primitive iliacs, in their early progress, must be judged of by the same rules which guide the practitioner in forming his opinion of those of the great arterial trunk. They often in the end make their appearance externally in the iliac fossa of the groin, and it is not always easy to distinguish them from those of the external iliacs. This, however, is a problem for the surgeon.

Treatment.

Though internal aneurisms are in the end generally fatal, yet much may be done to palliate their harassing symptoms, and to prolong life; and, when the tumour is of that kind in which coagula form, hopes may even be indulged of effecting cures. It is very certain that spontaneous cures have taken place; and there is reason to believe that the efforts of nature have in some instances been materially aided by the resources of art. It must be always borne in mind by the physician, that the method of cure employed by nature is generally to fill the sac with fibrinous deposits or coagula of blood, and his efforts should be directed to assist in this process.*

Two indications are obvious; one to lessen the distending force, and the other to sustain or increase the coagulability of the blood. A third may be added; that, namely, of producing contraction in the parietes of the sac. These should be constantly borne in mind in the treatment.

To meet the first indication, those measures at once suggest themselves which are calculated to reduce the heart's action, and lessen the volume of the blood; and of these venesection would seem to be the most efficient. Hence, this remedy long enjoyed great reputation in the treatment of aneurism, especially in connection with a very low diet, and perfect rest. This was the method of cure employed by Valsalva and Albertini, which has given celebrity to their names. By copious and repeated bleeding, and a rigid system of abstinence and of rest, these physicians and their followers kept their patients, for months, at the lowest point of reduction compatible with life; and are said to have had considerable success. But subsequent experience has not confirmed the first favourable reports as to the efficacy of this plan; and the probability is, that, from the uncertain means of diagnosis at that time employed, cases were occasionally mistaken for aneurism which were of a different nature. Nor would the views at present prevalent, relative to the influence of venesection upon the blood, lead us to expect anything else than failure from a plan of reduction so excessive. In the first place, inordinate depletion does not always produce a reduction of the heart's action. On the contrary, by inducing a state of anæmia, it frequently occasions an irritable condition of the circulation, in which the pulse becomes frequent and jerking, and the heart beats tumultuously; a condition anything but favourable to the cure of aneurisms. (See *Anæmia.*) In the second place, it impairs the coagulability of the blood, and thus deprives nature of the very instrument upon which she relies for the repair of the injury. Thirdly, it tends to increase that depressed condition of the vital forces, upon which the organic disease of the vessels, so often the first step in the formation of aneurism, probably, at least in some measure, depends. Besides, in a feeble constitution, especially when disease of the heart is associated with the aneurism, it would favour the tendency to dropsical effusion, and would greatly increase the danger, already considerable, of fatal syncope. Nor will patients generally submit to so rigid a system of self-denial so long continued; and, if attempted, it can seldom be carried thoroughly into effect. The blood may be taken, and the strength thus reduced to the lowest standard; but what is to prevent some unusual and forbidden movement of the patient, which, in his state of exhaustion, might prove of serious injury, if not fatal, by calling the heart into a degree of action beyond its power? But, notwithstanding these dangers of excessive depletion, the indication for a diminution of the quantity of the blood, and the force of its motion still remains; and the question is how it may be best answered. The reply must depend on the condition of the system. If the patient is plethoric, with a strong, full pulse, and apparently rich blood, he should lose a sufficient quantity to reduce and keep down the excess. If the aneurism is complicated, as not unfrequently happens, with some thoracic or ventral inflammation, the indication for bleeding is strengthened. Perhaps it would be proper to keep the action of the heart a little below par. From twelve to twenty ounces may be taken at once, and afterwards a smaller quantity, say from six to eight ounces, at intervals of some weeks, or whenever the system may exhibit evidences of a return to the original excess. But if the paleness of lips, and irritable state of the circulation, characteristic of the anemic condition, should begin to make their appearance, the plan of depletion must be at once abandoned; and great caution should be exercised not to confound this condition with one of real vital exaltation. Individuals show a marked constitutional difference in this respect, some being disposed to plethora and others to anæmia. This difference should be attended to, and allowed to influence the course of treatment.

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* To promote coagulation of fibrin within the cavity of aneurisms, various local measures have been suggested, few if any of which are applicable to those of the chest or abdomen. A measure, however, has been proposed by Mr. C. H. Moore, Surgeon of the Middlesex Hospital, London, and carried into effect in one desperate case of thoracic aneurism, which, though it failed, deserves notice, and may possibly be tried with better success in others. It consists in introducing fine iron wire in considerable quantity into the cavity, through a canula, so that it may form coils, and thus present a large surface for the coagulation of the blood. Only aneurisms which point externally, and are otherwise quite desperate, are proper subjects for this operation. In this instance 26 yards of wire were introduced; not more than half an ounce of blood was lost; and no difficulty appears to have been experienced in the healing of the external wound. On the fifth day after the operation the patient died, obviously from the effects of the operation, although the first symptoms were favourable, and coagulation had been effected in the outer sac. As shown after death, the wire had not penetrated the sac within the chest. The patient apparently died of inflammation of the parts, but whether caused by the wire, immediately, or by the great quantity of the coagulum newly formed could not be determined. (*Med.-chir. Transact.*, A.D. 1864, p. 129.)—*Note to the sixth edition.*

The lancet may with great propriety be aided by the use of purgative medicines; and these may be resorted to in cases in which that remedy might be improper. The saline cathartics are generally to be preferred; and jalap and cream of tartar form an excellent combination. The saline cathartics are peculiarly useful by diminishing the bulk of the circulating fluid, without depriving it in an equal degree of its coagulability, and, at the same time, by their tendency directly to diminish the action of the heart. Another advantage is the removal of the serous effusion, so frequently attendant upon the disease, and, if in the chest, so apt to increase the distress of the patient. The cathartic may be repeated twice or three times a week, and even more frequently in some cases. A very good plan, when there are dropsical symptoms, is to give from half an ounce to two ounces of bitartrate of potassa, in divided doses, diffused in water, every day, and continue the medicine until it shall produce dyspeptic symptoms, when it may be omitted, to be resumed after their disappearance. The diuretic action of this salt is of great advantage.

In decidedly anemic cases, a wholly different plan of treatment must be adopted. In these, the excessive action of the heart is sustained by the impoverished condition of the blood. To quiet the circulation it is necessary to enrich that fluid, and in doing so we meet also the second indication above referred to, that, namely, of rendering the blood more coagulable. Instead of the lancet and active purgation, we must now resort to mild tonics; and of these the preparations of iron are beyond all others applicable to the case. The pill of carbonate of iron, combined with a little rhubarb or aloes, if a laxative effect is required, and continued for a considerable time, will be found perhaps the most efficient remedy. The infusion of wild-cherry bark is also admirably calculated to meet the indication, by its tonic influence over the digestive function, and its sedative action on the heart.

In either of the above cases, *digitalis* may be employed as an adjuvant. It should be given in moderate quantities, long continued, with occasional intermissions, however, to prevent the effects of accumulation. It proves useful by repressing the action of the heart, without impairing the coagulability of the blood; and, by its diuretic action, lessens the quantity of watery fluid in the circulation, and promotes the absorption of any that may have been effused. *Hydrocyanic acid* may also be used in reference to its sedative influence, but caution is required in its management. It is worthy of consideration whether *ergot* would not prove advantageous. Its application to this disease is suggested by its admitted power in restraining hemorrhage, and by its occasional extraordinary sedative action upon the pulse. To do good it must be continued long. Danger might be apprehended from its known tendency, in large quantities, to occasion mortification of the extremities. I have, however, never seen or heard of such a case, occurring in consequence of the employment of ergot in medicinal doses; and cannot but think that, with moderate caution in watching its effects, any danger of the kind may be avoided.

Acetate of lead has been considerably used as a remedy in aneurism, and very favourable accounts of its action have been published. I have employed it now and then for the last twenty years, and, though sometimes with apparent benefit, have never seen a complete recovery under its use. To be effectual it must be given so as to affect the system, and afterwards persevered in for a long time. In this case it is apt to produce colic, with nausea or vomiting, which proves so disagreeable to the patient, that he is sometimes with difficulty induced to resume the remedy after the subsidence of the symptoms. A grain may be given three or four times a day, and continued until it induces some disturbance of the primæ viæ, when it should be suspended for a time, and afterwards resumed. It is better calculated than any other internal remedy to meet the third indication in the treatment of aneurism, that of contracting the parietes of the sac. With the same view, alum has been employed in aortic aneurism.

If thoracic or abdominal inflammation attends the aneurism, or if the sac itself is inflamed and painful, it may be proper to detract blood locally by cups or leeches, and afterwards to apply blisters or other revulsives. But if the tumour is near the surface, these remedies should not he applied immediately over it, for fear of causing the skin to slough. Calomel and squill will sometimes prove useful, especially when there is effusion in the chest.

It will often be necessary, in the course of the treatment, to employ narcotics or antispasmodics to relieve pain, and quiet nervous disturbance. Opium, hyoscyamus, camphor, assafetida, &c. may be resorted to.

Local applications may be made over the tumour with the hope of aiding in its reduction. Cold water and ice have been recommended; but they cannot be long steadily persevered in. Perhaps some good might result from cold astringent poultices, made, for example, with decoction of oak bark or infusion of galls. Dr. Hope recommends a belladonna plaster, when the tumour is painful, or requires support.

A case is recorded by Dr. Wm. Murray in the *Medico-chirurgical Transactions* (A.D. 1864, p. 187), in which a cure of aneurism of the abdominal aorta seems to have been effected by compression of the artery above the tumour. It was ascertained that, by pressure with the hand in this position, the circulation in the aorta could be completely commanded. The compression of the vessel was effected by means of a tourniquet, which was continued for about five hours, the patient being kept under the influence of chloroform. Until

the last hour, the slightest relaxation of the pressure showed, by the return of the pulsation, that the disease had not been controlled. After the removal, though there was at first slight pulsation, the tumour in a short time became quite pulseless, and continued so as long as the case remained under observation; and a complete cure seems to have been effected. Without the aid of chloroform it was thought that the end could not have been attained.

The diet should conform to the circumstances of the case. It should always contain materials capable of furnishing fibrin to the blood. Bread, fruits, and vegetables with milk, and a small quantity of boiled meat, would be applicable to ordinary cases. In those of an anemic character, meat may be more freely employed. Boiled are preferable to roasted meats, as less stimulating, while they contain an equal amount of fibrin. Broths are objectionable, as they contain the most stimulating portions of meat, at the same time that they tend to increase the bulk of the blood. As little drink should be allowed as is compatible with the comfort of the patient.

In relation to exercise, the patient should be kept for the most part at rest, and should most cautiously avoid all hasty movements, and all kinds of exertion. Passive exercise in an easy carriage may prove useful by sustaining the digestion, and the general processes of secretion and nutrition, in a healthful state. The utmost care should be taken to preserve mental equanimity; as few things have a more powerful influence in calling the heart into undue and dangerous action than strong moral excitement.*

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Causes.—The causes are numerous. Whatever is capable of extending an irritation to the great sympathetic nerve, and especially to the solar plexus and its ganglia, seems to be capable of producing it. The persons in whom it is most apt to occur are those of a highly nervous temperament. Hypochondriacal, hysterical, and anemic individuals are peculiarly susceptible to it. Perhaps it is most frequent in anæmia, and especially in that form of it usually associated with uterine derangement, as in chlorotic and hysterical females. It has been observed to follow copious hemorrhage from the stomach, rectum, and uterus. Hepatic derangement, an irritated or dyspeptic state of stomach, disorder of the bowels, in short, congestion, irritation, or inflammation of the abdominal viscera generally, appear to be capable of exciting it. Tenderness in the epigastrium is a not unfrequent attendant. It has been observed in connection with tenderness of the spine. It sometimes appears to be one of the forms of nervous gout and rheumatism; as it has been known to cease suddenly upon the occurrence of gout in the extremities. There is reason to believe that it sometimes results from the excessive use of tobacco, coffee, and tea. Simple flatulence of the bowels will sometimes bring on a paroxysm in those predisposed to it. Dr. Stokes has found it to attend intestinal and peritoneal inflammation, as increased pulsation of the radial artery attends a whitlow. Indeed, he considers it a good sign of intestinal inflammation when it exists along with fever, and the aortic pulsation is proportionably more active than that at the wrist. Notice has been especially attracted towards it as an accompaniment of pancreatitis, of which it has even been supposed to be a pathognomonic sign. It may arise from the pressure of tumours or enlarged viscera. It is not improbable that it sometimes results from an original irritation, active congestion, or inflammation of some portion of the solar plexus, which supplies nerves to the artery.

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Diagnosis.—The affections for which this pulsation is most apt to be mistaken, are aneurism and organic diseases of the heart. If no abdominal tumour exist, there will be little difficulty in distinguishing it from the former affection. Its irregular occurrence and frequent absence; its occasional disappearance upon the removal of some temporary cause, such as flatulence; the state of system with which it is frequently associated; and the character of the pulsation, which is quick and jerking, instead of being slow, expansive, and heaving, as in abdominal aneurisms, are generally sufficiently diagnostic. But positive certainty may be obtained with the stethoscope. By the aid of this instrument, the pulsation may be observed for a considerable distance along

the last hour, the slightest relaxation of the pressure showed, by the return of the pulsation, that the disease had not been controlled. After the removal, though there was at first slight pulsation, the tumour in a short time became quite pulseless, and continued so as long as the case remained under observation; and a complete cure seems to have been effected. Without the aid of chloroform it was thought that the end could not have been attained.

The diet should conform to the circumstances of the case. It should always contain materials capable of furnishing fibrin to the blood. Bread, fruits, and vegetables with milk, and a small quantity of boiled meat, would be applicable to ordinary cases. In those of an anemic character, meat may be more freely employed. Boiled are preferable to roasted meats, as less stimulating, while they contain an equal amount of fibrin. Broths are objectionable, as they contain the most stimulating portions of meat, at the same time that they tend to increase the bulk of the blood. As little drink should be allowed as is compatible with the comfort of the patient.

In relation to exercise, the patient should be kept for the most part at rest, and should most cautiously avoid all hasty movements, and all kinds of exertion. Passive exercise in an easy carriage may prove useful by sustaining the digestion, and the general processes of secretion and nutrition, in a healthful state. The utmost care should be taken to preserve mental equanimity; as few things have a more powerful influence in calling the heart into undue and dangerous action than strong moral excitement.*

Article IV.

ARTERIAL PALPITATION.

THIS name is given to an increased pulsation or throbbing in the arteries, which can be felt by the individual affected. It bears the same relation to

the ordinary state of these vessels that palpitation of the heart does to the healthy action of that organ. It may occur in any of the larger arteries, but is most frequent in the aorta, especially in that portion of it which lies behind the epigastrium. It is only in the abdominal aorta that it has attracted particular attention, or requires special notice here. From its frequent occurrence at the pit of the stomach, it is sometimes designated by the name of *epigastric pulsation*.

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* *Cure of Aneurism by Rest.* In the *Med. Times and Gaz.* for April, 1865 (p. 345), is an epitome of a pamphlet by Mr. Joliffe Tufnell, in which an account is given of the supposed cure of five out of six cases of aneurism, two of which were thoracic and four abdominal. The remedy employed was mainly rest, in a recumbent position, maintained perseveringly and uninterruptedly for ten weeks or two months at least, and aided by a diet such in relation to quantity and quality as to supply a duly fibrinous blood, but not too much of it. The circumstances should be so arranged as to render the process as little irksome to the patient as possible. The bedstead should be placed in such a way as to admit of defecation, and, if necessary, the administration of an enema, without disturbing the patient. "Upon the bedstead must be placed two hair mattresses, one upon the other, both full and elastic; upon these, in a proper site to receive the sacrum and hips, a large water-cushion, properly but not over-filled; upon this a double blanket, sown at the corners and sides to the lower mattress, and upon the blanket a fine linen sheet similarly attached; another linen sheet being placed transversely to receive the buttocks, and to be drawn from beneath from time to time. Three or four good feather pillows to prop the shoulders, and receive the head, with the over-clothes, complete the bed." The patient is to lie without changing position, except occasionally from side to side, or upon his face, should these movements give relief. A urinal and bed-pan should be provided, with a person always near, to aid, "read to, converse with, or amuse him." In relation to the diet, the least quantity of fluid that will answer should be permitted. Mr. Tufnell's scale is the following: "For breakfast, two ounces of white bread and butter, with two ounces of cocoa (chocolate) or milk; for dinner, three ounces of broiled or boiled meat, with three ounces of potatoes or bread, and four ounces of water or light claret; for supper, two ounces of bread and butter, and two ounces of milk or tea; making in the aggregate ten ounces of solid and eight ounces of fluid food in the twenty-four hours, and *no more*." Should the thirst or hunger of the patient be uncontrollable under this regimen, the former may be allayed by allowing him to suck a pebble, or occasionally a small piece of ice, the latter by a sufficient increase of food to induce tranquillity. In connection with these measures, narcotics may be given to relieve pain, laxatives, if necessary, to obviate costiveness, and various medicines, as quinia, the chalybeates, iodide of potassium, &c., to meet indications which may be presented. (*Note to the sixth edition.*)

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the aorta, instead of being confined to one spot, and in no part of the vessel extends laterally beyond its limits, as it does in aneurism. The double shock sometimes occurring in the latter affection is never perceived. The murmur, too, is very different from the aneurismal; and is often associated with a similar murmur in the carotid and subclavian arteries, and a venous murmur in the jugulars. When tumours exist in the abdomen, and receive an impulse from the throbbing artery, the diagnosis is more difficult, but may still in general be made out with sufficient distinctness. (See *Aneurism*, p. 254.) The absence of organic disease of the heart will be best proved by the want of its characteristic physical signs.

Treatment.—From what has been said above, it will be inferred that no single plan of treatment is adapted to all cases of aortic palpitation, depending as it does upon causes so numerous and different. The primary object must be to search out the derangement, functional or organic, in which it may have originated, and to apply remedies to this derangement. The condition of the liver, of the stomach, of the bowels, and of the abdominal contents generally should be carefully examined, and corrected by appropriate means if found deranged. Should evidences of inflammatory congestion or irritation exist in the spine, or should there appear good reason for suspecting its existence in the solar plexus, cups or leeches applied to the back, followed by blisters or other revulsives, would be the proper remedies. It might even be advisable to take blood from the arm, should the pulse be strong and excited. Under the same circumstances, saline cathartics and a restricted diet will be useful. In anemic cases, an opposite plan must be adopted, consisting in the use of chalybeates and nutritious animal food. Care must be taken also to arrest all exhausting discharges. Sometimes narcotics and antispasmodics become necessary to allay nervous disorder. For this purpose, hyoscyamus, conium, lactucarium, camphor, valerian, assafetida, musk, compound spirit of ether, or opium, may be resorted to. The cold shower-bath will occasionally prove useful. If the patient is much troubled with flatulence, a fluidrachm of one of the aromatic tinctures, as the compound spirit of lavender, or the compound tincture of cardamom, or a draught of strong infusion of ginger, will often dissipate the symptoms. In very obstinate cases, it may be advisable to resort to a gentle mercurial course, with the object of removing any latent inflammation in which the pulsation may originate. The use of tobacco, coffee, and strong tea should be abandoned, or at least suspended for a time, till it is ascertained whether they might have been the cause. Exercise, fresh air, agreeable mental occupation, cheerfulness of spirit, and, as the most effectual method of combining these requisites, a journey to some watering-place, especially to one of the chalybeate and saline springs, will be among the most effectual remedies.

SUBSECTION III.

DISEASES OF THE VEINS.

Article I.

INFLAMMATION OF THE VEINS, OR PHLEBITIS.

INFLAMMATION of the veins, though not often an original disease, is a frequent consequence of other affections, especially of wounds or other injuries, whether accidental or the result of operations, and is one of the greatest causes of solicitude to the surgeon and obstetrician.

Symptoms, Course, &c.—The complaint is characterized by pain and great tenderness along the course of the affected vessel, which often feels like a hard cord, knotted at intervals, and rolling under the fingers. It is usually attended with swelling of the parts adjacent, and of those through which the ramifications of the vessel are distributed. The limb below is often greatly distended, partly from the effusion of liquid consequent upon obstruction to the returning blood, and partly from the propagation of inflammation to the other tissues. This tumefaction sometimes obscures the hardness of the vessel itself, which therefore escapes notice unless upon careful examination.

Fibrinous matter is thrown out by the coats of the inflamed vessel, and blood coagulates in layers upon its inner surface, so as at length completely to fill up its caliber, and thus to produce that obstruction to the circulation, and hardness of the vessel above alluded to. If the vessel affected is small, the consequences of the obstruction are not necessarily serious; but, if one of the larger trunks, especially those in the interior, is the seat of the inflammation, they may be fatal, and are always dangerous.

If the inflammation should now subside, it may happen, partly by the solution of the coagulum, and partly by the pressure from behind, that the blood may make its way again through the vessel, and the circulation be restored. But more frequently the obstruction continues, the blood finds a passage through other vessels which are enlarged for the purpose, and the inflamed vein, through a process of organization and absorption, is gradually reduced to the condition of a hard impervious cord, or ligamentous string. With the return of the circulation the swelling in the limb gradually subsides, and the patient ultimately recovers, though not always without some residuary hardness or tumefaction of the parts affected.

But, if the disease advances, suppuration ensues; and the pus, which is sometimes largely produced, is either confined by the coagulated blood and exuded lymph within certain portions of the vessel, thus constituting abscesses along the vein, or, if not thus restrained, is carried along with the current of blood, and contaminates the circulation. The former of these events is the more desirable; as the disease then remains local, and the question of recovery is resolved into the extent of the inflammation, and the patient's strength of constitution. If he have vigour enough to carry him through the processes requisite for the discharge of the pus, and the granulation of the abscesses formed, recovery will take place; and this may be confidently expected when only the smaller vessels are involved. But if the caliber of the vein remain pervious, and the pus mix with the mass of the blood, the consequences may be most serious. Even then, however, if the purulent admixture be small, it is probable that no constitutional disturbance of any moment will ensue. If large, it often produces fatal disorder.

In some cases, owing to peculiarity in the cause and consequent nature of the inflammation, or in the previous health or constitution of the patient, the formation of pus is not preceded or attended by adhesive inflammation and fibrinous exudation, and the blood in the vessel has no disposition to coagulate. Pus is formed upon the inner surface of the vein, and is washed away by the current of the blood, which thus becomes contaminated. This condition of venous inflammation is by far the most dangerous, giving rise to the most violent constitutional disturbance, and, if life is not thus immediately destroyed, to the production of abscesses or purulent depositions in various parts of the body, by which the system is at length exhausted.*

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* Mr. Henry Lee, Surgeon of the Lock Hospital, London, infers, from experiments performed by himself, that the coagulated fibrin, lining the inner surface of the veins, or more or less completely filling the cavity, in phlebitis, is not produced by exudation from the surface of the vein itself, but is deposited directly by the blood. In an experiment

The secondary effects of phlebitis are often of great importance. Independently of those to which attention will be called hereafter, as the milk-leg and metastatic abscess, inflammatory affections of important organs, more or less directly connected with the inflamed veins, take place, which add greatly to its dangers. Thus, caries of the bones of the ear sometimes becomes the starting-point of phlebitis, which in one direction penetrates the sinuses of the brain, and thence passes to its substance, and in another passes down the veins of the neck, and sets on foot inflammation of the lungs and pleura, generally of a low character, and sometimes ending in gangrene. (See *Med. Times and Gaz.*, April, 1855, p. 351.)

The constitutional symptoms of phlebitis vary with the stage of the inflammation and its character. In the ordinary adhesive variety, in its earlier stages, they are those of common symptomatic fever, commencing usually with more or less rigor, and differing only by greater frequency and less strength of pulse. The occurrence of suppuration is usually marked by repeated chills, and a general relaxation of surface, attended frequently with profuse sweats, especially during sleep. In those cases in which there is reason to believe that pus has somewhat largely entered the circulation, the fever is of a low and often typhoid character. The pulse is very frequent, small, and feeble; the respiration hurried; the skin pale, and often sallow or dusky; the extremities cold; the countenance anxious, sunken, and haggard; the tongue generally dry, and covered with sordes; the stomach occasionally irritable; and the bowels costive, or affected with diarrhœa. Extreme restlessness, muttering delirium, and other marks of nervous derangement are frequent attendants on the disease, which, under these circumstances, is generally fatal. It is not impossible that these symptoms may occur, independently of the generation of pus, from a propagation of inflammation along the great venous trunks towards the heart, or from a general vitiation of the blood, and prostration of the nervous energy, in consequence of some other poisonous influence.

When pus is produced in the larger veins, the danger is greater; for the chance is less that it will be confined by the obstruction of the vessel.

The diagnosis of phlebitis in the extremities is usually not difficult; but obscurity often attends it when seated in the internal veins of the abdomen or thorax. In such cases, the occurrence of a hard edematous swelling, with more or

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upon an ass, in which measures were taken to produce inflammation of the jugular vein, the blood being entirely excluded, the lining membrane was found perfectly smooth and glossy, and there was no fibrinous exudation observable. (*Medico-chirurg. Trans.*, xxxv. 191.) It is probably true that the lining membrane of the veins, being like that of arteries without blood-vessels, is not capable itself of throwing out coagulable lymph, or any other product of inflammation; but as the other membranes of the veins are capable, when inflamed, of all the changes which other tissues undergo in a similar condition, it may be readily conceived that the liquor sanguinis exudes from them, passes through the inner membrane, exactly as through the proper serous tissue, which is equally exempt from vessels, and either coagulates on the inner surface, or is converted into pus, according to the state of the parts, and of the system. (*Note to the fourth and fifth editions.*)

The opinion of Virchow (*Cell. Pathol.*, Am. ed., p. 230) that, in what has been called phlebitis, the coagulation of the blood is not due to inflammation of the coats of the vessel, and that what has been supposed to be pus in the veins is merely a degraded state of the coagulated fibrin, which is contained within the centre of the coagulated blood, and is not in contact with the walls of the vessel, may be true in reference to cases which have come under his own notice, but cannot be received as evidence of the non-existence of real phlebitis, as ordinarily described. At least a much more extended series of observations will be necessary to establish the fact that previous observers have been so greatly mistaken. Nor can it be admitted, without hesitation, that the puruloid matter, considered by him as degraded fibrin, is not real pus; for, though it consists largely of mere granules, which is to a certain extent the case also with pus, yet it contains many cells, undistinguishable from pus-cells, considered by him as white corpuscles of the blood. The readers of this work are aware that, in the views of the author, inflammatory suppuration itself is only a degeneration of the fibrin exuded in the process. (*Note to the sixth edition.*)

less of a purplish aspect, in exterior parts, the veins of which carry blood into the interior trunk affected, may be regarded as a strong evidence of its existence. Thus, such a swelling in one of the lower extremities, occupying the whole limb, without any evidence of inflammation of the femoral vein, may be considered as diagnostic of phlebitis of the corresponding iliac vein, and, if in both limbs, of the same disease in the vena cava. I have had a case exactly of this kind, in which the diagnosis was confirmed by post-mortem examination. The original cause of the phlebitis, in such cases, is apt to be cancer of one or more of the viscera.

Inflammation of the portal vein. Portal phlebitis.—Generally in relation to the external veins, and not unfrequently in relation to the inferior venous trunks which convey the external blood to the heart, there are signs by which inflammation may be recognized with considerable certainty. But it is different with the portal vein, which both begins and terminates within the abdomen. It is highly probable that inflammation of this vein and its ramifications occasionally takes place, and, ending favourably, escapes notice from the obscurity of its symptoms. It is only in the fatal cases, the nature of which is revealed by dissection, that it has been recognized with an approach to certainty. A short account of the symptoms, in these cases, may prove useful by facilitating a diagnosis of the disease in its milder forms, or earlier stages, while yet amenable to remedies. The affection has been generally overlooked by systematic writers. I am indebted for most of the following facts to a paper of Dr. E. Leudet, published in the *Archives Générales* for February, 1853 (*page* 145), which contains a detailed account of a case observed by himself, and a summary of facts deduced from an examination of the cases heretofore placed on record. The affection makes its attack in general somewhat abruptly, but sometimes gradually. The first observable symptom is usually a dull pain in the epigastrium or hypogastrium, increased by pressure, and, as the case advances, extending more or less over the abdomen, which becomes in some degree tympanitic. Occasionally the superficial veins are distended. Febrile symptoms set in accompanied with a remarkable tendency to chills, which are among the most striking features of the complaint. These chills occur quite irregularly, in some instances several times in the same day, and are not generally followed by sweats, though these do sometimes take place. The liver is often enlarged, and the patient is more or less jaundiced; but neither of these conditions is universal. The spleen is also sometimes enlarged. Not unfrequently there is more or less nausea, vomiting, and diarrhœa. A case is recorded in which the sudden occurrence of ascites was ascribed to this disease; the splenic branch of the vena portæ being completely clogged with coagulated blood. (*Boston Med. and Surg. Journ.*, lix. 278.) Typhoid symptoms make their appearance before the close, with frequent pulse, delirium, coma, and great prostration. The duration of the complaint is from one to three weeks, or more. The cases have uniformly terminated fatally. The cause is for the most part unknown. Frerichs teaches that it is almost invariably consequent on suppurative disease of the organs in which the veins originate; but though true in some instances, it is probably not universally so; and so far as can be inferred from the records, the affection is at least occasionally idiopathic. In some recorded cases, it has certainly originated in a focus of inflammation, or in local injury. In one case, the cause was a fish bone, which had passed through the coats of the stomach, and perforated the portal vein. In a case observed by M. Leudet, the starting-point seemed to be an injury inflicted on the rectum by the point of a syringe. A case is recorded in the *New York Medical Times* (ii. 162), which probably originated in inflammation of the bowel, consequent on the partial strangulation of a fold of the intestine, passing through a rupture in the omentum. It is probable that some of the cases of multiplied abscesses of the liver, accompanying tropical dysentery, are the result of portal phlebitis, having its origin in the ulcerative affection of the bowel.

Anatomical Characters of Phlebitis.—The appearances after death are redness of the inflamed vessel; a thickened, contracted, softened, or indurated condition of its coats; coagulable lymph adhering to its inner surface, or loose within its cavity; coagula of blood often completely plugging up the vessel for a considerable extent; and generally more or less pus, sometimes confined by adhesions within small portions of the tube, sometimes completely surrounded by coagulated blood, and again lying loosely in the vessel. Occasionally, too, portions of the vein are quite obliterated, and reduced by absorption to the form of an impervious cord. The parts about the vessel also exhibit signs of inflammation, having contracted adhesions from fibrinous exudation, or being more or less infiltrated with pus. Redness alone, without thickening, softening, ulceration, or either fibrinous exudation or the presence of pus, is not considered a sure sign of inflammation.

In *portal phlebitis*, the coats of the veins have been found of a grayish colour, and so much thickened that the vessels did not collapse. The inner coat was much thickened, coagulated fibrin adhered to the inner surface of the portal vein, and occasionally the clots were so large as nearly to fill the vessel. There was usually abundance of pus, more or less mingled with blood, both in the trunk and in its intestinal and hepatic ramifications, and sometimes in the splenic vein. Numerous abscesses existed in the liver, and between the folds of the mesentery; and the veins in their course were sometimes bathed in pus. In some instances, the peritoneum exhibited signs of inflammation.

Causes.—Phlebitis almost always arises from local injury or inflammation, in which the veins of the part are involved, either directly or by contiguous sympathy, or from the entrance of acrid or septic matters into their cavity. The inflammation, once established, is readily propagated along their course; and the tendency of phlebitis appears to be, contrary to what has been observed of arteritis, to run from the smaller vessels to the larger with which they are continuous, thus following the course of the blood. Sometimes very slight injuries are sufficient to give rise to the disease, partly owing to the state of the patient's constitution at the time, and partly to the peculiar circumstances attending the injury. Thus, it may arise from a slight focus of inflammation, whether ulcerative or not, in one of the toes, and may thence run up the leg and thigh with serious consequences. Any wound of a vein, which from its nature or inaccurate closure does not unite by adhesive inflammation, is apt to generate phlebitis. Hence its occasional occurrence after venesection, especially when a dull lancet has been employed, or one soiled by contact with diseased matter. Hence too the frequency of the disease after division of the saphena, or other operation for varicose veins of the leg. Perhaps the great liability to phlebitis, and the consequent danger in these cases, depend partly upon the previously morbid condition of the vessel. Amputations and operations on parts largely supplied with veins not unfrequently prove fatal, in consequence of venous inflammation proceeding from the cut surface. Puerperal women are peculiarly liable to this disease; the veins of the womb taking on inflammation after delivery, and propagating it to the larger venous trunks with which they communicate. The veins proceeding from the part of the uterus at which the placenta was attached are especially liable to be affected, and the spermatic vein upon one side is most frequently inflamed. The hypogastric veins are also apt to be attacked, and through them the inflammation sometimes reaches the iliac and femoral veins, and even extends into the vena cava. Some of the worst forms of puerperal fever probably owe their malignity to phlebitis originating in the womb; and phlegmasia dolens may generally be traced to the same origin. Fractures of the skull are apt to occasion plebitis. Contusions, abscesses, cancerous sores, caries, ulcerated surfaces, and any other form of suppurative inflammation may become a focus whence the disease may spread, and carry the seeds of danger or death into the system. The veins running from such centres have often been observed to be filled with pus. It has been a question whether, in such cases, the pus is taken up by the veins, and merely conveyed by them into the circulation, or whether it is the result of an inflammatory process in their own structure. Possibly both events may happen; but, taking all the circumstances into consideration, it seems to me most probable that it is generated for the most part in the veins themselves; for, if it were taken up by them, why should we not find the vessels similarly loaded in all cases of large purulent collections of similar character? Of one of the results of this morbid process there will be occasion to treat directly. Phlebitis has sometimes, though very rarely, arisen from cold, like other inflammations; and it is said to have resulted from the translation of rheumatic or gouty irritation. From the circumstance that it originates generally in local injuries, it follows that the large interior venous trunks are seldom primarily affected.

The existence of a predisposition seems to be, if not essential to the production of phlebitis, certainly very promotive of it; as precisely the same local condition, so far as can be discovered, which produces it in one case, will have no such consequence in many others. The character of the predisposition has great influence in determining whether the resulting inflammation is to be adhesive or suppurative. A feeble and depraved state of health is most favourable to the latter, and therefore greatly aggravates the danger of the disease. It is probable that some unknown distemperature of the atmosphere favours the origin of phlebitis, which appears occasionally to prevail almost epidemically, especially among puerperal women.

There is an affection, usually considered of obscure origin, which has been recently traced, if not with certainty, yet with a considerable degree of probability, to phlebitis as its source. This is phlegmasia dolens. Metastatic abscess has been thought by many, and still continues to be thought by some to be another example of phlebitis; but it belongs more properly to a peculiar disease of the blood, which has received the name of purulent infection. The consideration of the former belongs to this place; that of the latter, though in preceding editions treated of under the same head, is in the present more appropriately, I think, transferred to the subsection which embraces the diseases of the blood.

Phlegmasia Dolens.—Phlegmasia Alba Dolens.—Crural Phlebitis.—Milk-leg.—This affection occurs generally in women after delivery, but sometimes also in the unmarried, and occasionally even in males. It usually commences about a week or two after delivery, though the interval may be much longer. In some instances, it is preceded by febrile symptoms, in others, is ushered in with a chill occurring simultaneously with the local affection, and in others again, and these are the most numerous, commences with pain. This is usually felt first in the loins or lower part of the abdomen, whence it extends to the groin, and thence to the vulva, and down the thigh and leg. Sometimes, however, it shows itself first in the lower parts of the limb, as in the calf, travelling upwards, and in other cases in two distant points at the same time. At first it may be only an aching sensation with soreness, and a sense of weight or stiffness in the part; but it soon increases and becomes acute, severe, and sometimes even excruciating, being felt most along the course of the internal cutaneous and crural nerve in the thigh, and of the posterior tibial in the leg. The limb soon begins to swell, and, in the course of forty-eight hours, is sometimes of twice its usual dimensions. The labium pudendi is similarly affected. With the swelling, the acuteness of the pain generally abates in some measure, but the soreness continues, and is aggravated by every movement. The limb is in general slightly flexed, and quite motionless, as if paralyzed. The swelling, when at its height, is uniform over almost the whole limb, which is unnaturally white, shining, hot, and firm and elastic to the touch. It does not pit upon pressure, except sometimes at the commencement, and at the decline of the swelling. When cut, it exudes only a small quantity of fluid. Sometimes red lines are observed in the course of the crural veins, and red patches here and there upon the limb; but the colour, as just stated, is usually white. The tenderness is greatest along the femoral vein, which may almost always be felt like a hard cord. Sometimes this hardness is confined to the groin, sometimes may be felt all the way down the thigh and leg, and in other instances occurs in distinct parts of the course of the vessel. The uniformity of the cord is interrupted by occasional nodules, arising either from inflamed areolar tissue, or coagula in the cavity of the vessel. The lymphatic glands of the groin are usually hard and swollen. Both limbs are seldom attacked at the same time; but it sometimes happens that one becomes affected after the recovery of the other. The left is more frequently attacked than the right. The disease is said sometimes to extend to the arm of the affected side. It is attended with a very frequent pulse and other febrile symptoms, often with nausea and vomiting, and sometimes with suppression of the lochia and the milk.

Phlegmasia dolens generally terminates favourably, though constitutional symptoms occasionally make their appearance, such as have been ascribed above to the entrance of pus into the circulation, and the patient sinks. The acute symptoms are in most cases over in two weeks; but the limb often continues more or less swollen or hard, for a long period, sometimes even for life. In favourable cases, the symptoms gradually subside; the pain, hardness, and swelling abate; and the blood, which can find no passage through the large internal veins of the limb, is returned by the superficial vessels, greatly enlarged for the purpose. Sometimes erysipelatous inflammation occurs in the limb, and abscesses form in different parts of it, as well as in different parts about the pelvis, greatly increasing the danger of the patient, and, in some instances, proving fatal.

In all the fatal cases examined within a few years, marks of inflammation have been found in the femoral vein, frequently extending into the veins of the leg, and sometimes occupying almost all the venous ramifications of the limb. The caliber of these vessels has been filled with coagulated blood, solidified fibrin, and pus; and coagula have also been observed in the external, internal, and primitive iliac veins. In the external iliacs the signs of inflammation have been strongly marked, and were traced by Dr. Lee from these to the veins of the uterus. The other tissues of the limb have also been found inflamed, but apparently in a secondary manner.

Very different opinions have been held as to the nature of phlegmasia dolens. At first considered as the result of a metastatic secretion of milk in the limb, it was afterwards with more appearance of reason ascribed to inflammation of the absorbents, and still later to general inflammation of the areolar tissue, muscles, and inner surface of the skin. Various observers had detected evidences of phlebitis in the great veins of the thigh, among whom Dr. Davis, of England, and M. Bouillaud, of France, were the most conspicuous; and the opinion was advanced that the disease might consist essentially of this affection; but it was not until the inflammation was traced to the veins of the womb by Dr. Lee, and the point of origin thus clearly established, that this opinion acquired full confirmation. There scarcely appears room at present to doubt that, however other tissues may be subsequently involved in the disease, the structure primarily affected is the veins; and that, when the complaint is consequent upon delivery, inflammation of the uterine veins is its starting-point. But the comparative rarity of the disease, under circumstances of delivery not essentially different, would seem to point to some other cause than injury of the uterine vessels; and we must seek for this in peculiarity of constitution, or the peculiar state of system at the time. It is supposed by some that the coagulation of the blood in the veins in these cases is not owing to inflammation of the vessels themselves, but to a poisonous principle in the circulation; but, even overlooking the consideration that there seems to be no particular reason why that poison should operate especially upon this particular part, we have other proof of the existence of phlebitis in the exquisite tenderness of the veins and the neighbouring tissue upon pressure.

Affections in most respects identical with phlegmasia dolens have been observed in women after abortion, and in others affected with malignant ulceration or other organic disease of the unimpregnated uterus, or in whom that organ had suffered violence, as from the application of a ligature for the removal of polypus. Men, too, have been similarly affected in consequence of organic disease in the pelvic viscera, or injury inflicted on these parts; and attention has been called, by Drs. Tweedie, Graves, and Stokes, to the occasional occurrence of inflammation of the lower extremities, in all essential points identical with that under consideration, following fevers. A case of the kind occurred in a patient of my own, after recovery from an attack of peritonitis, which came on during convalescence from typhoid fever. The same thing has also been observed in dysentery; and, in one fatal case, inflammation and consequent obstruction of the common and external iliac and femoral veins were discovered upon dissection.[*] It sometimes occurs under circumstances in which it cannot be traced to any local origin outside of the parts which it occupies, so that it may be considered as idiopathic. A case of this kind, occurring in a woman, aged 67, is described by Dr. C. D. Cambell, of Ireland, in the *Dublin Hospital Gaz.* for June 1, 1858.

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[*] By experiments upon dogs. Dr. F. M. Mackenzie, of London, has proved, 1. that inflammation artificially excited in the veins of these animals in health is confined to the vicinity operated on, and does not spread to the veins below, so as to produce phenomena analogous to those of phlegmasia dolens; 2. that irritation or inflammation of the internal surface of a vein causes the blood in contact with it to coagulate; and 8. that an irritant injected into the circulation, coming into contact with the internal surface of the veins generally, may produce extensive irritation and consequent coagulation of the blood. (*Medico-chir. Trans.*, xxxvi. 169.) Hence it was concluded by Dr. Mackenzie that phlegmasia dolens does not depend on the propagation of inflammation from the veins of the uterus to those of the lower extremity; but upon a diseased state of the blood, which, acting as an irritant to the inner surface of the veins of the limb, causes the coagulation of the blood within them, and thus gives rise to the phenomena of the disease. But it is not shown why the general condition of the blood should affect simply the veins of one extremity, in preference to those of other parts which are equally exposed to its irritant influence. It appears to the author that Dr. Mackenzie's experiments simply prove that, in health, a local phlebitis is not extensively propagated, and that in order to this result there must be some vice of constitution peculiarly predisposing to it, which is exactly what has been stated in the text. Whether this vice exists in the solid tissues, or in the blood, has not been determined; but that it does not consist of an irritant in the circulating fluid, operating as the direct excitant agent, is, I think, shown by the almost uniform localization of the affection in a particular part. It may readily be conceived that the predisposition consists in a peculiar irritability of the veins, the result possibly of a depraved nutrition, which determines that, a point of inflammation being established, it shall rapidly spread through the tissue, just as, in the erysipelatous predisposition, inflammation in a single point of the skin will be rapidly propagated over an extensive surface. It seems, therefore, most probable that, in this disease, the focus of inflammation exists in the uterus, whence, in consequence of the predisposition referred to, there is a propagation of the affection through the coats of the veins, causing, wherever it attains a sufficient degree of intensity, coagulation of the blood in contact with the membrane; and this disposition to coagulation of the blood, under the circumstances mentioned, is the most interesting result of Dr. Mackenzie's experiments. Why the irritation should extend towards the origin of the veins, contrary to the direction of the blood, and contrary to what ordinarily happens in phlebitis, is not obvious. Perhaps it may be that coagulation at any one point, producing obstruction there, and causing the blood to be delayed in the veins below, may be the determining agency. (*Note to the fourth edition.*)

Chronic Phlebitis.—Various organic changes have been observed in the veins after death, which may have originated in chronic inflammation. Thus, they have been found thickened so as considerably to diminish their caliber, ulcerated, perforated, and softened; and rupture has sometimes occurred, in consequence of an unusual stress upon their coats in this fragile state. They are not unfrequently thinned and distended; their valves are sometimes partially or wholly destroyed; and calcareous deposits are found, though very rarely, between their coats. The small, loose concretions, of the size of a pea, or less, called *phlebolites*, which are occasionally met with in the veins, may, as suggested by Andral, sometimes originate in their coats, and, projecting into the cavity with a slender attachment, may be separated by a slight force; but they are thought generally to form in the blood itself, probably at first as a coagulum of blood or lymph, in which calcareous matter may be subsequently deposited. The veins are liable also to other organic affections, as steatomatous tumours and hydatids, and participate in the various diseases of neighbouring tissues. The derangements alluded to, however, are more objects of curiosity than of practical interest; for they generally offer, during life, no phenomena which would lead either to an accurate diagnosis or a just treatment.

Treatment.—The pulse in phlebitis is not usually strong enough to call for the lancet, though in some instances it may be resorted to with advantage, especially in the earlier stages. It should never be omitted when the symptoms are active, and the circulation tolerably vigorous. The very free use of leeches along the affected vein is of the greatest importance. They should not only be applied once, but should be repeated over and over again, if the symptoms of inflammation persevere. In phlegmasia dolens, they are in general most effectively applied in the groin and upper part of the thigh, over the femoral vein; but they should also follow the track of the tender and hardened vessel, wherever it can be traced. The leeches may be followed by cold saturnine lotions, or simply cold water, applied by means of linen cloths, or by warm fomentations and emollient cataplasms, according as one or the other of these measures is found most comfortable to the patient. The local vapour bath has sometimes proved salutary. A severe case, attended with high constitutional symptoms, is said to have yielded rapidly to the application of a mixture of collodion and castor oil, which must have operated by excluding the air; the use of the oil being to give a due degree of softness or plasticity to the pellicle of collodion. To relieve the very severe pain, anodynes, such as the preparations of opium, hyoscyamus, belladonna, conium, stramonium, or hops, may be incorporated with the refrigerant or emollient applications. When the bowels are not already too much disturbed, as they are apt to be in bad cases of the disease, saline cathartics may be employed, alternated with diaphoretic doses of tartar emetic, the neutral mixture, and other internal refrigerant remedies. Should the disease not seem disposed to yield, mercury should be resorted to, and pushed to a moderate salivation. Calomel or the blue pill may be given, in combination with opium or hyoscyamus; and mercurial frictions may be employed to hasten the impression upon the system. Throughout the complaint, it is often necessary, or at least advisable to control the severe pain and relieve restlessness by anodynes, and especially opium, which may be combined with ipecacuanha or tartar emetic in the earlier stages. After the subsidence of the violent symptoms, if the swelling remain hard, and appear disposed to become indolent, blisters should be employed; and, when leeches cannot be procured, they may be resorted to at an earlier period. A low diet, and perfect rest of the limb affected in the horizontal position, are also essential parts of the treatment. When great prostration comes on, whether from the absorption of pus, or the exhaustion of the suppurating process, it is necessary to support the system by stimulant remedies and a nutritious diet.

Wine-whey, carbonate of ammonia, quinia or infusion of bark, opiates, and animal broths and jellies are now appropriate; and these general measures may be employed, even though it may appear proper to make efforts for the relief of the inflammation by local depletion.

During convalescence, care should be taken not to employ very energetic measures for hastening the reduction of the tumefaction. Time is required for the sufficient enlargement of the new veins, through which the blood must make its exit from the limbs. Premature irritation might endanger an increased inflammation. But, with this caution, ointments of iodine or mercury, or of both, may often be usefully applied with the view of promoting absorption; and blisters may be resorted to with the same object. Should considerable œdema remain, it may generally be corrected by bandages, and the use of diuretics, such as squill and bitartrate of potassa.

Article II.

VARICOSE VEINS.

THIS affection, which consists in a dilatation of the veins, belongs in general to the province of surgery, and a very few remarks will suffice in this place. The dilatation may be extensive and pretty uniform, or local, and as it were in pouches. The vein is also generally lengthened, causing that tortuous appearance so common in the affection. In most instances, there are knots at intervals along its course. The coats of the vessels are sometimes thickened, sometimes attenuated. The affection may originate in relaxation of the veins, in consequence of which the ordinary pressure produces their expansion; or in a long-continued and unusual degree of pressure from position, ligatures, &c., even though the vessel may have been previously healthy. Not unfrequently the two causes act conjointly. When the internal veins become obliterated or obstructed, those near the surface often enlarge very much, under the pressure of the increased amount of blood which seeks a passage through them. Varicose veins upon the surface of the chest and abdomen are among the signs of impediment to the passage of blood through the great trunks of the interior of these cavities. It is probable that they may also result from rapid growth, under the influence of the recuperative powers of the system. The affection has been ascribed to disease of the valves, which, ceasing to close the vessel, no longer support the column of blood, which therefore presses with undue force upon the coats below. This is probably true in some cases; but not to the extent at one time supposed. As the veins dilate, the valves become incapable of performing their duty, and the disease may advance more rapidly from this cause. A loud venous murmur, rising and falling with respiration, is sometimes heard in the superficial varicose veins in front of the abdomen. It is ascribed by Dr. Herbert Davies, of London, to the vibratory movement of the edges of the valves, which, in consequence of the enlarged caliber of the vessel, are unable to prevent the regurgitant current. (*Med. T. & Gaz.*, April, 1863, p. 385.) Owing to the pressure of the accumulated blood, its return from below is retarded, and hence arise tumefaction and occasional œdema of the limb, sometimes attended with much pain, inflammation, and obstinate ulceration.

Spontaneous cures are sometimes effected by the occurrence of adhesive inflammation, giving rise to the exudation of coagulable lymph, obstruction of the vessel, and its ultimate obliteration through the process of absorption. Various attempts have been made to effect cures by surgical operations; but these have often proved fatal by inducing phlebitis, and are much less frequently resorted to than formerly. The safer measure of equable and firm pressure is preferred when it is applicable. This may be assisted by the frequent application of cold water over the enlarged vessels; and some advantage may be expected from astringent lotions and cataplasms, where circumstances admit of their continued use. If inflammation should supervene, rest, a horizontal or elevated position, leeches, and lead-water are the appropriate remedies. A stimulating diet and stimulating drinks should be avoided as conducive to plethora. The mechanical measures necessary to produce pressure, and give due support to the vessels, belong to the surgeon.

SUBSECTION IV.

DISEASES OF THE BLOOD.

Article I.

PLETHORA.

A MORBID increase of the blood beyond the wants of the system is called plethora. It is not, however, a mere augmentation of volume in the circulating fluid that is entitled to that name. This may result from an excess of the watery ingredient, and is not incompatible with the state of anæmia, which is the opposite of that of plethora. There must be a morbid increase of those constituents of the blood upon which its nutritive and stimulant properties depend, and to which it owes its peculiar character, such as the red corpuscles, fibrin, and albumen. There may or may not be an increase of bulk.

There is no precise proportion of the active principles of the blood, which is alone compatible with health. Their quantity constantly varies with the varying sources of supply, and extent of consumption; and, within certain limits, no inconvenience is experienced from this irregularity. Even when derangement of function results from an excess of blood, if it be moderate, and speedily relieved, as very often happens, by an increased activity of secretion, or a diminished vigour of the process of sanguification, the excess scarcely deserves to be considered morbid. It is only when the derangement is threatening or very inconvenient, or continues long without relief, that the affection would come under the designation of plethora.

It is not necessary that there should be an absolute increase of the blood, in order to the existence of the disease. The quantity may remain precisely the same, and yet, if the wants of the system for the support of its various functions should diminish, the phenomena of plethora may result; for it is the loss of balance between the supply and consumption, the former being in excess, that constitutes the affection.

Symptoms.—Florid cheeks, and redness of the lips, tongue, conjunctiva, and mucous surfaces generally wherever visible, are usually considered as evidences of plethora; and they frequently are so; but they are also occasionally wanting, when the capillaries are from any cause inactive, or the excess is not so much in the red corpuscles as in the other active constituents of the blood. The pulse is ordinarily full, strong, and somewhat accelerated. When the affection is moderate, there is a slight feeling of heaviness, mental and bodily hebetude, and disposition to sleep, which increases in severe cases, and is attended with a sense of fulness or tension in the head, vertigo, tinnitus aurium, or headache; and sometimes palpitations of the heart and oppressed breathing are added to, or replace the cephalic symptoms. Bleeding from the nose or rectum is not uncommon. Blood drawn from the arm is often more highly coloured than in health, and affords a larger coagulum, with comparatively little serum. It seldom exhibits the buffy coat, unless the affection is complicated with inflammation. Plethora is said by writers to be frequently attended with obesity. This may occasionally be the case; but, though the habit is often full, I have not usually found plethoric patients fat, and not unfrequently they are quite thin; the very deficiency in the nutritive function being probably one of the causes of the excess of blood. The copious secretion of adipose matter has a tendency to keep down any plethoric accumulation to which the individual may be predisposed.

Causes.—A loss of equilibrium between the supplying and expending processes is the immediate cause of plethora. Digestion and absorption are relatively more vigorous than nutrition and secretion. The former processes may be healthy, while the latter are defective; or the former may be in excess, while the latter are healthy; or both may be deranged in different directions, and thus co-operate to the same result. Whatever occasions this loss of equilibrium is a remote cause of the disease. Excessive eating, especially of animal food; stimulating condiments or drinks, which excite digestion into preternatural activity; and indolent or sedentary habits, which occasion a deficient expenditure of blood in the various vital processes, are, singly or conjointly, the most efficient agents in the production of plethora. It is especially apt to result, when long-continued active exercise is suddenly followed by sedentary life. The invigorated appetite and digestion produced by the former, continue for a while after its cessation, and throw copious supplies into the circulation; while the previous expenditure is cut short or diminished, in consequence of the want of bodily activity. Continued moderate warmth, especially following cold weather, sometimes gives a morbid vigour to the process of sanguification. Hence, the system is apt to become plethoric in spring. Certain constitutional influences have the same effect; such, for example, as pregnancy, which is often attended with plethora. Some individuals have a peculiar tendency to the over-production of blood, and become plethoric without any assignable cause; and these are of course most readily affected by ordinary causes. Whatever checks secretion may give rise to the complaint. Cold sometimes probably acts in this way. The sudden stoppage of an habitual discharge, to which the system has accommodated itself, is an occasional cause. Hence, in part, the accidents which follow the drying up of long-continued issues, the healing of old ulcers, the cessation of habitual hemorrhage from the nostrils, rectum, or uterus, and the omission of venesection after its frequent employment at certain intervals. From what has been said, it might be inferred that plethora is more common in females than males; and such is asserted to be the fact. Children are thought to be less subject to it than adults, in consequence of the vigour of their nutrition. Perhaps the period at which it is most apt to occur, is that of approaching maturity, when the body ceases to expand, and the processes concerned in sanguification have not yet fully adapted themselves to the new condition of the system.

Nature and Effects.—An excess of either of the active ingredients of the blood, without a diminution of the others, would strictly constitute plethora. The cases, however, which most frequently attract notice are those characterised by a superabundance of the red corpuscles; because the affection is, in these, more obvious to a superficial examination, and the occurrence of hemorrhages gives greater apparent occasion for solicitude. But there may be others not less important, in which the fibrin and albumen have become unduly accumulated. The tendency, in the former cases, is to hemorrhages and febrile action, in the latter, probably, to inflammation. Both may give rise to congestions. Andral expresses the opinion, that plethoric patients are not more likely to contract inflammation than others; and the remark may be true if, with him, we restrict the application of the term plethora to cases of excess merely of the red corpuscles. My own observation would lead to a different conclusion in relation to the disease, as I understand and have defined it.

Treatment.—In the treatment of plethora, reference must be had to its duration. If it be temporary, and not immoderate, it will be sufficient to restrict the diet to vegetable food exclusively, or to this along with milk, to administer refreshing and mucilaginous drinks, and to keep the bowels freely open by saline laxatives. Should the symptoms be in any degree alarming, threatening apoplexy, for example, or indicating dangerous pulmonary congestion, the lancet should be resorted to, and employed with a freedom corresponding to the danger. There is some hazard, however, in a too frequent resort to venesection in this complaint. The system accommodates itself at length to the repeated losses by a proportionate increase in the activity of sanguification; and if, under these circumstances, the abstraction should be inadvertently omitted, serious hemorrhages or other lesions might ensue. In cases of a protracted character, where the tendency to plethora is such that an excess is generated almost as fast as relieved by depletion, the lancet is admissible only to obviate immediate danger. The cure is to be effected here by a careful removal of all the causes; by a regulation of the diet, the avoidance of stimulants and tonics, and by frequent bodily exercise, of a kind not calculated greatly to excite the heart. In relation to the food, the abstemiousness should be in proportion to the obstinacy of the case. The patient should not sleep too warmly; and mattresses are, therefore, preferable to feather beds. He should also avoid confinement in over-heated apartments. The secretions should be sustained. If the skin be dry and the capillaries inactive, advantage will accrue from the occasional use of the warm bath and moderate friction to the surface. Scanty urine may be relieved by cold drinks, with the aid of saline diuretics, especially bitartrate of potassa. Constipation may be obviated by the refrigerant laxatives. But the most important remedies by far will be found in diet and exercise properly regulated.

Article II.

ANÆMIA.

By anæmia (from α, privative, and αἷμα, blood) is understood a morbid deficiency or poverty of the blood. It is not necessary that there should be a deficiency in the volume of the circulating fluid. On the contrary, this is often quite as great in the disease as in health, and perhaps sometimes even greater. But, in such cases, the nutritive constituents of the blood are in less than their regular proportion, while the watery part is in excess. Any condition of the blood would come under our notion of this disease, in which, either from deficiency in its general amount, or want of due proportion in its nutritive and stimulating ingredients, the functions of the body should be deranged in a considerable degree, or for a considerable length of time.

There are two forms of this disease, one suddenly, and the other gradually induced. The former may be called *acute*, the latter *chronic anæmia*. Under these names they are here considered. There is, besides, a form of anæmia, associated with certain peculiar symptoms, which give it a distinctive character. From one of these symptoms, an extraordinary prominence of the eyes, it has received the name of *exophthalmos*, under which I shall notice it, as one of the varieties of the disease under consideration.

1. *Acute Anæmia.*

This consists in a sudden diminution of the mass of blood, produced by copious bleeding or profuse hemorrhage. The whole volume of the blood is lessened, while its ingredients bear to each other the ordinary relation. The morbid phenomena attending the affection depend on two causes, *first*, the sudden abstraction of the stimulus of pressure exerted upon all parts of the system when the blood-vessels are full, and *secondly*, the diminution of the supporting and stimulant influence of the blood upon all the functions of life. It is marked by universal paleness and coolness of the surface, diminution in the force and volume of the pulse, giddiness, disordered or impaired vision, dilated pupil, nausea and vomiting, great muscular debility, faintness, cold sweats, and not unfrequently irregular muscular contraction, amounting even to convulsions. Sighing, gasping, restlessness, jactitation, and delirium are also among the occasional symptoms. Not unfrequently complete syncope results. If, upon the occurrence of this phenomenon, the blood cease to flow, recovery may generally be effected, though not always. If the loss continue unabated, it must terminate in death. It has its origin usually either in venesection, spontaneous hemorrhage, ruptured aneurisms, ulceration or sloughing of the larger vessels, bleeding from wounds, or flooding in childbirth. The treatment consists of means calculated to arouse the failing or suspended actions of life, and, when immediate danger is passed, of such as tend to supply the deficient blood. To answer the first purpose, the patient should be placed with his head low, cold water should be sprinkled on the face, and ammoniacal liquids held near the nostrils. Should these fail, artificial respiration may be resorted to, or even the transfusion of blood from the veins of a healthy individual, in cases otherwise desperate. After animation has been restored, the patient should be kept at rest, in a recumbent position, for a time proportionate to the degree of debility; as injury might result from over-action of the heart consequent on fatiguing exertion under such circumstances. This measure is highly important. A man was once brought almost bloodless into the Pennsylvania Hospital, in consequence of profuse hemorrhage from the bowels. The hemorrhage had ceased, but he was in the last degree exhausted. Particular direction was given that he should on no account leave his bed; but in the night he arose to go to the water-closet, and fell dead on the floor. On examination no blood was found in the bowels, so that his death was not occasioned by a recurrence of the hemorrhage. It is scarcely necessary to state that the diet should consist of nutritious and easily digestible articles of food.

2. *Chronic Anæmia.—Chlorosis.*

This is a frequent attendant upon other recognized diseases, which impair the processes of digestion and sanguification, or drain the system of its blood; but it also appears to have occasionally an independent existence, and often requires the chief attention of the practitioner. It therefore merits distinct consideration. One of its most ordinary forms is that usually designated by the name of *chlorosis* or *green sickness*. Some authors consider this as distinct from true anæmia; but even these place its characteristic feature in poverty of the blood; and it would be difficult to point out a single essential phenomenon in the complaint, which may not be traced to that source. The fact that it generally occurs in girls or young unmarried women would only prove that there are circumstances in their situation peculiarly operative in the production of the disease, and not that there is anything peculiar in the disease itself. Nor is chlorosis confined to girls, or even to the female sex. The authors who treat of it as a distinct affection acknowledge that it is sometimes met with in married women, and in males of delicate constitution, especially about the age of puberty. In these latter cases, there is scarcely a shadow of distinction between it and anæmia proceeding from causes which leave no doubt as to its nature. I shall, therefore, consider it under the present head.

Symptoms.—When the complaint is fully formed, there is commonly universal paleness of the skin; the lips, tongue, and mucous surfaces in general are also strikingly pale; there is extreme whiteness of the conjunctiva; and the whole surface of the body appears bloodless. Sometimes the face is yellowish or sallow, and has a waxen aspect. With this change of colour there is often a puffiness of the face, especially of the eyelids; the skin seems translucent; and, when the fingers are held up, the light shines through their edges. The lower extremities are apt to be edematous. The patient is feeble, and cannot bear much exertion, to which also he is usually indisposed. The circulation is irregular, but almost always weak. The pulse is often full, frequent, and thrilling or vibrating as in aneurisms; but it is soft, and easily compressed, showing a want of energy in the heart's impulse. It is almost always greatly quickened by bodily exercise or mental emotion. When the patient is entirely quiet and in a recumbent posture, it is often small, rather slow, and feeble. Palpitation of the heart is a very common symptom. It is sometimes continuous, sometimes irregularly intermittent, and may be induced by the slightest causes mental or physical. Violent exertion often throws the heart into the most tumultuous action. Pulsation in the carotids is often obvious, and the stethoscope, applied over these arteries or the subclavians, discovers almost always morbid sounds, such as the bellows murmur; while the large veins, as the jugulars, yield a humming sound. The respiration, though quiet when the patient is at rest, becomes hurried and even painfully agitated under exertion, as in running, ascending heights, &c. The nervous system is often much disordered. Vertigo, dizziness, tinnitus aurium, and faintness are very common; and spasmodic movements of the muscles, sometimes amounting to convulsions, are not unfrequent, especially in females. Violent and obstinate neuralgic pains in the head, side, breast, or other part of the body, are also frequent attendants upon the disease. Even delirium has been noticed. The secretions are sometimes diminished; and associated with this condition are extraordinary dryness of the skin, brittleness of the nails, and harshness of the hair. In other cases, on the contrary, there are profuse and exhausting sweats. In females, the menses are almost always either altogether wanting or greatly deficient, being scanty and light-coloured or even serous. The bile is also frequently scanty; and costiveness with unhealthy alvine evacuations, and a dyspeptic state of stomach are extremely common. The symptoms in young women sometimes so closely resemble those of phthisis, that, unless the practitioner is on his guard, he may readily make an erroneous diagnosis. There are cough, pallor, emaciation, frequent pulse, night-sweats, and irregularity of menstruation; but it need not be said that the characteristic physical signs of phthisis are wanting. Various organic affections are often associated with anæmia, some of which act as causes of the condition, and others probably are effects. Among the latter, there is good reason to believe that hypertrophy and dilatation of the heart may be included The excessive action of the heart so common in anæmia may lead to the former of these affections, and the feebleness of the parietes from defective nutrition, to the latter.

When blood is drawn, it is found to be much lighter-coloured than in health; sometimes, in extreme cases, appearing like reddish dish-water. Upon coagulation, it exhibits a great excess of serum; the clot being very small, of a light-reddish or rosy tinge, instead of the deep-redness of health, and floating in an abundance of nearly or quite colourless liquid. It is, however, usually rather firm, and not unfrequently exhibits a buffy and even cupped surface. The proportion of red corpuscles is obviously much diminished; and the same is prebably the case, to a certain extent, with the fibrin; for, though Andral states, as the result of his experiments, that the fibrin and the albumen are in the normal proportion in spontaneous anæmia, this remark is not applicable to cases which result from repeated hemorrhage, and even in the former case, considering the occasional exceeding diminutiveness of the coagulum, can hardly be received as of universal application, unless after a much more extended series of observations. It must be admitted, however, that there is usually a great deficiency of red corpuscles, not only in relation to the watery portion of the blood, but also to its remaining solid constituents. Even in the anæmia from hemorrhage, this relative deficiency is observable; for, though all the constituents are lost in the same proportion, yet the organs concerned in the production of blood, find in the system much larger supplies of the albuminous and fibrinous principles than of those which constitute the red corpuscles; and, besides, as these probably are a higher result of vital organization, they must be the last to be generated. The cause of the buffy coat of the clot in anæmia is the relative excess of the fibrin over the red-corpuscles. It is altogether independent of inflammation.

It has been stated that a bellows murmur is heard when the stethoscope is applied over the large arteries of the neck. The same sound is in a less degree heard in the heart. Andral asserts that it is never absent in true anæmia, and that it is inseparably associated with a diminution in the due proportion of the red corpuscles. He never met with it in cases in which the proportion of fibrin or of albumen alone was lessened. The degree and continuance of the sound bear some relation, though not a constant one, to the diminution of the corpuscles. Supposing the mean proportion of the corpuscles to be 125 in health, Andral found that the bellows sound exists constantly in the arteries when the proportion is reduced below 80, occasionally when it falls between this number and the physiological mean, and never when it exceeds the latter point. Some inference may thus be drawn as to the degree in which the blood is impoverished in anæmia. The commencement of the affection may thus also be detected, before it has begun to exhibit itself by its characteristic feature of paleness. Occasionally persons with a rather florid complexion exhibit many symptoms of anæmia, such as general debility, feebleness and excitability of the pulse, palpitation and hurried respiration during exertion, &c. In these it would be difficult to verify the existence of the affection unless by means of auscultation.

In that form of anæmia commonly called *chlorosis*, the subjects are usually girls between the periods of puberty and maturity. The complaint is in most cases very gradual in its advance, and is often from the beginning attended with deranged digestion and costiveness. The appetite is irregular, sometimes defective, sometimes excessive, and occasionally morbid in its preference for particular substances. The breath is often offensive. Listlessness, indisposition to exertion, and an expression of sadness or dejection are not unfrequent features of the disease in its earlier stage. The complexion gradually fades, until at length it becomes of a pale, sickly hue, with a yellowish or greenish tinge, which has given rise to the name of the complaint. The other symptoms already enumerated are slowly developed. The menses either do not make their appearance, or, if they have occurred, gradually undergo diminution in colour and amount, until they entirely cease. The nervous symptoms are peculiarly prominent, and the patient is not unfrequently afflicted with all the harassing train of hysterical disorders.

In its early stage the disease is usually very manageable, and, when there are no organic complications, and the patient can be withdrawn from the influence of the causes, may in general be cured, or at least placed in a fair way of recovery, in a period of time varying from two to four weeks. Under opposite circumstances, and especially when improperly treated, it may terminate fatally. When long continued, it is apt to induce dropsy, and probably also organic disease of the heart. The excessive action into which this organ is thrown by the call from the capillaries for a more rapid current of blood, to supply the deficiency of nutritive material, leads to an enlargement; while defective nutrition renders it soft and flabby.

Upon dissection, the arteries and veins are found empty, or scantily supplied with a serous fluid; the flesh is dry, and does not bleed when cut; effusion of serum is observed in the pleura, pericardium, peritoneum, and areolar tissue; the heart is pale, soft, flabby, and often dilated; and various organic affections are not unfrequently discovered, such as tubercles, carcinomatous tumours, and enlargement or other disease of the liver, spleen, kidneys, or ovaries. When these latter affections are found, the probability is that they were the cause and not the effect of the morbid state of the blood.

Causes.—The lymphatic temperament is believed to predispose to this complaint. The immediate causes are either such as directly detract from the amount of the blood, or such as diminish its production. Frequent bleedings repeated at short intervals, and spontaneous hemorrhages constantly recurring, such as epistaxis, the hemorrhoidal flux, hæmatemesis, and menorrhagia, are among the first set of causes. In the same category may be placed copious secretory discharges, especially from the bowels and uterus. To the second set of causes belong, in the first place, the want of due materials out of which the blood may be elaborated, and, secondly, derangement of the processes of digestion and sanguification by which it is produced. Food insufficiently nutritive, of difficult digestion, or otherwise unwholesome; the abuse of coffee and tobacco; excessive drinking, even of water; habitual exposure to cold and dampness; sedentary habits, or prolonged over-exertion; debilitating agencies in general; the depressing emotions, as grief, dissappointment in love, ambition, or business, concealed and unanswered affections, and mental anxieties of all kinds may be ranked among the causes of anæmia. The influence of the sexual apparatus may possibly in some unexplained mode interfere with sanguification, so far as to induce or favour the production of the disease. This is inferred merely from the circumstance that it is most apt to attack young women about the age of puberty. Amenorrhœa, which has been sometimes ranked among the causes of this disease, is more probably one of its effects, or at most a joint result of the same influence. Organic diseases of the stomach, bowels, liver, spleen, and heart are frequent causes of anæmia, probably by interfering with the processes by which the blood is produced. Chronic debilitating diseases have the same effect, partly through a similar influence, and partly by exhausting the blood. Bright's disease of the kidneys, in its chronic form, is very generally attended with anæmia, resulting in part at least from the loss of albumen, and probably, as shown by Dr. J. T. Plummer, of the extractives of the blood, with the urine. (See *Am. J. of Med. Sci.*, N. S., xxvi. 389.) Among the most frequent causes of anæmia in this country are the miasmatic fevers, and the visceral disorder, whether splenic or hepatic, which they so frequently leave behind. Chronic disease of the spleen is an extremely frequent associate of the affection, and probably very often in the relation of its cause. Cases have occurred in which the disease has attacked at the same time numbers of persons employed in coal mines, and the result has been ascribed to the dampness, and want of light and pure air; but such cases are uncommon, while the causes to which they are ascribed are always in operation. In the particular cases recorded, the anæmia was preceded by severe disease of the bowels, to which, probably, more than to the circumstance alluded to, the effect may be ascribed. (*Dict. de Méd.*, xii. 581.) The inhabitants of very elevated mountainous regions are subject to an anemic condition, which has been ascribed to deficiency of oxygen. (Dr. Jourdanet, *Arch. Gén.*, Avril, 1863, p. 495.) The constitutional action of the preparations of lead has sometimes been evinced in the production of anæmia.*

Treatment.—In the treatment of anæmia it is of the utmost importance to remove the causes. While these continue to act, the use of remedies will be only of temporary benefit. Should the digestive system be in disorder, it must be corrected; constipation must be obviated; any hemorrhage or other drain which may exist must be arrested; the menses, if retained, suppressed, scanty, excessive, or otherwise irregular, must be restored to the healthy state; and, in general, any other existing disease which may impair the digestive and assimilative processes, or debilitate the system at large, must, as far as possible, be removed. The modes of treatment which may be necessary for these purposes are given under the heads of the affections respectively to be corrected, and need not be repeated here. Close attention must be paid to the peculiar circumstances of the patient; and, whenever any moral cause is discovered to which the complaint may in part or wholly be ascribed, efforts should be made to obviate its influence. In chronic cases, moderate exercise in the open air, and especially on horseback, should be encouraged; but in the acute, rest is necessary until the blood has been replenished. The patient should sleep in well-ventilated apartments; and the ill effects of unequal temperature should be prevented by flannel next the skin. All these measures, by invigorating the general health, will have a tendency to produce a more copious supply of well-conditioned blood. The same end will be promoted by a nutritious and digestible diet, as recommended in dyspepsia.

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* *Anæmia Lymphatica.*—A peculiar form of anæmia, connected with great enlargement of the lymphatic glands and of the spleen, first noticed between thirty and forty years since by Dr. Hodgkin, of London, who published an account of some cases in the 17th volume of the *Medico-chirurgical Transactions*, has, within a few years, been again brought to the attention of the profession by Dr. Sam. Wilkes, in *Guy's Hospital Reports* (A. D. 1859, p. 109). It appears to be quite different from leucocythæmia, also connected with disease of the spleen and absorbent glands, in the character both of the glandular affection and in that of the blood; the former being, in the disease under consideration, the result of an abnormal formation or deposit, impairing the function of the organs, while in leucocythæmia it is rather a hypertrophic condition exaggerating their function; and the latter being often destitute of any excess of the white corpuscles, which is the characteristic trait of the other complaint. The symptoms of this form of anæmia are extreme paleness, an apparently almost bloodless condition, a general disposition to dropsical effusion, and an aspect of the blood when drawn like that of pink-coloured water. The termination is in death from exhaustion. The lymphatic glands are enormously enlarged, especially those of the mediastinal and lumbar regions, though those of the neck and groin are often involved. On examination after death, they are found when cut to be uniform, translucent, and tenacious, appearing to consist of an albuminous or lardaceous matter in a fibroid tissue; and the same condition exists in the spleen. This is a very different affection from the enlarged spleen of miasmatic districts, which is a mere result of congestion. It would seem that the affection was due simply to a suspension of the functions of the lymphatic glands and spleen, through degeneration of their tissue.

Adénie of M. Trousseau.—Since preparing the above description of *lymphatic anæmia*, I have read in the *Archives Générales de Médecine* (Août, 1865, p. 206) an article on the subject of *hypertrophy of the lymphatic glands with anæmia, without excess of white corpuscles*, for which M. Trousseau proposes the name of *adénie*. While referring to cases seen by Drs. Wilkes and Pavy, the writer ignores entirely the cases long since described by Dr. Hodgkin, and gives priority to the French observations, of which the first was communicated to the public in 1856 by M. Boufils. There can be little doubt, I think, that the affection as described by the French and English writers is the same, though they do not appear to be in exact accordance as to the condition of the diseased glands; for, while the cases at Guy's Hospital presented the condition of these glands above described, in those seen in France there seems to have been nothing further discovered, on post-mortem microscopic examination, than mere hypertrophy, or a simple multiplication of the normal elements of the glands. This at least is the statement made by MM. Robin and Verneuil in reference to specimens examined by them. In others examined by M. Leudet, of Rouen, there existed in the parenchyma of the glands, neither cancer, nor fibro-plastic disease, nor amylaceous degeneration, but simply very small nuclei, less than those of the lymph-element, and having a strong analogy with the epithelial nuclei. (*Note to the sixth edition.*)

The medicines best adapted to the disease are tonics, and especially the chalybeates, which, besides an invigorating influence over the process of digestion and the vital processes generally, have a peculiar power of increasing the richness and redness of the blood, by an operation not exactly understood. They produce, indeed, the very effect that is most wanted in this disease, an augmentation, namely, of the proportion of red corpuscles.* Hence, the preparations of iron have been long considered almost as a sovereign remedy in chlorosis. It matters little which of the preparations is employed, provided the iron finds entrance into the system. That one should be selected which irritates the stomach least, and is most rapidly absorbed. Perhaps the best is the pill of carbonate of iron of the U. S. Pharmacopœia, which may be given in the dose of from 5 to 20 grains three or four times a day. The black impalpable powder of iron, the subcarbonate, black oxide, tincture of the chloride, solution of the iodide, potassio-tartrate, citrate, lactate, or sulphate, may also be used, at the discretion of the practitioner. Tannate of iron has been recommended as especially efficacious. When the case is one of pure anæmia, the chalybeates alone, united with a proper diet, will be sufficient for the cure. But, when the digestion is feeble, they may be advantageously combined with the simple bitters, such as the extract or infusion of gentian or quassia, and the powder or infusion of columbo; and the combination will be rendered more acceptable to the stomach by the conjunction of some aromatic, as ginger or cinnamon. Mild laxatives may be added in cases of constipation, and of these, when uterine disorder is not involved, the best is rhubarb. But, if amenorrhœa exist, aloes is the appropriate laxative, and should be given with each dose of the chalybeate in the quantity of one or two grains. The preparations of manganese have been recommended, and may be tried in cases which resist the chalybeates. The mineral acids are sometimes useful when the appetite is very languid, and, if the liver is functionally deranged, nitromuriatic acid should be preferred. But care should be taken that they do not prove injurious by a chemical incompatibility with the particular chalybeate employed. Nervous derangements may be combated by the occasional use of the antispasmodics, especially valerian and assafetida, and of the narcotic extracts, such as those of hyoscyamus and conium. The severe neuralgic pains which often attend the complaint may be relieved by blisters applied near the seat of the affection, and, if necessary, sprinkled with morphia after the removal of the cuticle. The daily use of the cold shower-bath, if followed duly by reaction, will often be found useful, and may be resorted to in obstinate cases; and dry frictions over the surface have been recommended.

It is often advantageous, in all forms of anæmia, in order to hasten or con-

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* The effect of iron upon the constitution of the blood is astonishing. The proportion of the solid constituents, and especially of the red corpuscles, is rapidly increased. The fibrin, however, appears to be somewhat diminished. The following results were obtained by Herberger, and correspond essentially with those of Andral and Gavarret, and of Simon. (See *Simon's Chemistry*, Syd. ed., i. 813.) The blood examined was that of a chlorotic female of 20 years. The first column contains the results before she had taken iron, the second, after a course of chalybeates, which continued eight weeks.

	1.	2.			1.	2.
Water	868·340	807·080	Albumen		78·200	81·300
Solid constituents	131·660	192·290	Globulin	Red corpuscles	86·470	94·290
Fibrin	3·609	1·950	Hæmatin		1·590	4·029
Fat	2·310	2·470	Extractive matters and salts		8·921	8·238

The diminution of fibrin is probably consequent upon its conversion into the substance of the red corpuscles.

firm convalescence, or even as a remedy in obstinate cases, to send the patient upon excursions to chalybeate springs at a distance from home, so as to combine with the medicinal effects of the iron the happy influences of exercise, pure air, novelty of scene, and the enjoyments of society. Unless complicated with serious organic lesions, the disease may generally be cured, or materially relieved, by the means above detailed, in a period varying from two to six weeks.

3. *Exophthalmos.*

This disorder consists in the association with anæmia of palpitation of the heart, throbbing of the arteries, vascular enlargement of the thyroid gland, and a singular prominence of the eyes. To constitute the affection it is not essential that all these symptoms should be united; for cases now and then occur in which one or more of them is absent; and, indeed, as they appear not unfrequently in a certain degree consecutively, it necessarily follows that, in some one of its stages, the complaint must often be deficient in some of its ordinary characteristics. The disease is not a new one; and cases presenting more or less of the phenomena had been noticed by various writers before its claims to be considered as a special disorder were generally admitted. The association of the cardiac palpitations and turgescence of the thyroid was noticed by Dr. Graves so early as 1835; and the affection was afterwards described by Dr. Stokes, with the addition of the enlargement of the eyes, the throbbing of the carotids, the double sound in these vessels, and the diastolic pulsation and purring thrill of the thyroid. (*Dis. of Heart and Aorta.*) But to Dr. James Begbie, of Edinburgh, is due the first complete and consistent view of the disorder, contained in a memoir presented to the *Medico-chirurgical Society* of Edinburgh in 1849, and published in the *Monthly Journal of Medical Science* for that year. On the continent, too, various observers, both in Germany and France, had at an early period recognized and more or less perfectly described the disease. The earliest of the German observers was Basedow, who published his account of the disease in 1840 under the name of *cachexia exophthalmica*, and for whom the honour of the original discovery has been erroneously claimed. More recently numerous memoirs upon the subject have appeared both in Europe and the United States; and, though there is much difference of opinion as to the pathology of the disease, there appears to be a very general agreement as to its distinct existence, and its characteristic features.

The subjects of the affection are chiefly women, especially in early life and about the cessation of the catamenia; but males are occasionally affected, and no age appears to be quite exempt, at least beyond that of puberty. The disease commences at first almost imperceptibly, and in general gradually advances to its full development. The prominent symptoms have been already mentioned in the definition of the disease. In the anæmia itself there does not seem to be anything peculiar. The palpitations are sometimes very violent, though variable; in some instances persisting for a long time, in others much moderated or even disappearing entirely to return again. It is this symptom that generally first attracts the attention of the patient, and induces her to consult the physician. The number of pulsations is increased to 100, 120, or 180 in the minute, and a case is recorded in which they are said to have reached 200. With the palpitations, there is also sensible beating of the arteries; and the throbbing of the carotids is sometimes so violent as to be painful to the patient, and visible at a considerable distance. The anemic murmur is generally heard over the heart, and a double murmur in the carotids, which also impart a purring thrill to the hand. The enlargement of the thyroid varies from a barely perceptible increase of volume, to the size of a large bronchocele. At first the tumefaction is obviously vascular; the blood-vessels are distended;

the thyroidal arteries pulsate strongly; and a thrill is perceived by the hand placed over the tumour. This is soft to the touch and not painful. In some instances, the swelling disappears spontaneously; but more generally it is permanent; and at last a real hypertrophic condition appears to result. The size of the spleen also is sometimes increased, though by no means uniformly so. But, perhaps, to the observer, the state of the eyes is the most striking feature of the case. They appear to be enlarged and protruding, with a fixed stare, and a peculiar look, which is sometimes spoken of as ferocious, savage, or expressive of wild astonishment. At first the patient can close the eyelids, but at length this becomes impossible, and a large portion of the conjunctiva is thus exposed to injury from dryness, which, however, is obviated in some degree by an excessive secretion of tears. Vision is not generally affected, and the eye is movable; but it has recently been ascertained that the upper lid, which in health, and even in other exophthalmic conditions, moves with the vertical motions of the ball, does not in this change its position; being as it were paralyzed. M. Von Graefe, who has called attention to this phenomenon, asserts that it is perceptible at a very early period, and is in fact a pathognomonic symptom. He ascribes it to disease of the sympathetic nerve. (*Am. J. of Med. Sci.*, Jan. 1865, p. 258.) There is difference of opinion as to the cause of this prominence of the eye, whether it is due to enlargement of the ball, or merely to its protrusion. Those who take the former view, consider that there is a vascular turgescence of the ball, distending its coats; while of those who hold the latter, some ascribe the result to effusion into the areolar tissue of the socket behind the eye, and others to relaxation of the muscles that hold the ball in its position. (Fleming, *Charleston Med. & Surg. Journ.*, Jan. 1859, p. 1.) It is stated that by moderate and equable pressure, continued for some time, the ball may be made to resume its natural position; and, as this would scarcely be possible, were the bulk really enlarged, while easily explicable upon the supposition of simple serous effusion in the areolar tissue, the fact seems strongly in favour of the latter view.

The course of the disease is generally slow, sometimes continuing for several years. In the earlier stages it is thought to be curable, or at least capable of great relief; but fully formed, and in the advanced stages, when the disease, functional at first, has become organic, it is often fatal. The heart, though originally free from lesion, becomes at length dilated and sometimes partially hypertrophied; and no doubt contributes to the unfavourable result.

Pathologists are not agreed as to the nature of the affection. While some consider it essentially anemic, others look on the anæmia as merely a result or coincidence. Prof. Laycock, of Edinburgh, in an elaborate essay on the subject, maintains the view that it is essentially a nervous affection, dependent on disease in the cerebro-spinal centres which supply the various organs affected with nervous influence. (*Ed. Med. Journ.*, Feb. and July, 1863.) That the several prominent symptoms are not essential steps in the chain of causation, appears evident from the fact, that each of them occasionally exists independently of the others, showing that they are all results of a common cause. Now as regards the cardiac, vascular, thyroidal, and ophthalmic phenomena, they may not irrationally be explained upon the supposition of disease in the sympathetic nerve, incapacitating it for the performance of its function of sustaining vascular contraction, and thus giving rise to congestion of the capillaries, and all the evidences offered of vascular excitement. The result of a recent post-mortem examination, in which the cervical portions of the sympathetic were greatly diseased, gives no little support to this idea. (*Med. Times and Gaz.*, Nov. 1865, p. 521.) The anæmia, however, is not satisfactorily explained in this way; and, admitting the nervous theory, it yet remains to be determined, whether the condition of the blood is the cause of the disease of the sympathetic ganglia, possibly by disposing them to fatty or other degeneration; or whether the two affections are mere coincidences, or the result of some common cause; or, finally, whether, in some unexplained way, the disease of the sympathetic may not have the power of destroying the red corpuscles of the blood. In favour of the opinion that anæmia is the essential and primary constituent of the disease is the nature of the causes in which it most commonly originates; such as exhausting uterine discharges or other uterine derangement, long-continued diarrhœa, bad living, exhausting labour, and, generally, the injurious influence of poverty and wretchedness.

In exophthalmic cases of anæmia, the treatment is to be conducted on the same principles, so far as the anæmia is concerned, as the ordinary chronic form of the disease (see *page* 277); and the superadded symptoms will generally be found to yield when that is corrected. Should the theory be correct which ascribes the peculiar phenomena to a depressed condition of the sympathetic nerve centres, the indication would be to apply hot water to the back of the neck or between the shoulders; or should the defective nerve-power be owing to congestion of the same centres, thus incapacitating them for the performance of their function, then recourse could be had to the ice-bags as recommended by Dr. Chapman. In the mean time, the excessive action of the heart might be moderated by the measures recommended under palpitation; cooling and astringent applications, such as solution of acetate or subacetate of lead, may be made over the thyroid; and means employed to protect the eyes from injury, as by the use of mucilage of sassafras pith.

Article III.

PURULENT INFECTION OF THE BLOOD.

Syn.—*Metastatic Abscess.—Pyæmia.—Pyogenic Fever* (Jenner).

By the term *purulent infection* is here meant a diseased state of the blood, attended with a low form of fever, generally dependent on the absorption or production in the circulation of a poisonous sanies from decomposed pus, and characterized by a tendency to the formation of multiple abscesses, or purulent deposits in various parts of the body. The affection presents itself in somewhat different forms, and has received from this cause, or from the discrepant views of writers, various names; but there is a certain family likeness in all of them; and, if not really identical, they certainly have a close affinity, which justifies, until their nature is more precisely determined, the grouping of them together under one head.

Metastatic abscess was the first form of the affection which attracted special observation. Abscesses, or collections of pus, occasionally form in various parts of the body, with little or no observable preceding inflammation in the part affected. Sometimes one of these collections springs suddenly into existence, and as suddenly disappears, to show itself in another situation. They have been observed especially in the parenchyma of the lungs and liver, where they are of various size, from the magnitude of a pea to that of a walnut; but they form also in other parts, and not unfrequently in the areolar tissue beneath the skin, among the muscles, and even in and about the cavities of the joints. I have had a case in which a large deposit of pus was found in the hip-joint. The eye has been known to be broken down and destroyed by such an abscess. These purulent collections are usually surrounded by a greater or less amount of inflammation. In many instances, their formation has been found to be coincident with the existence of some focus of ulceration or suppurative inflammation, as in the stump of an amputated limb, cancerous sores, caries of the bones, diseased uterus, ulcerated intestines, fractures of the skull, &c.; and the veins proceeding from such points have been observed loaded with pus. Different explanations have been given of these phenomena. One of the most obvious was that pus, absorbed from the focus of suppuration, and carried into the general circulation, is deposited at distant points, forming the abscesses in question. Hence the name of *pyæmia*, acquired by the affection. But to this view it was conclusively objected, that, in many instances, more pus exists in these metastatic collections than can possibly have been taken up from the supposed source, which is sometimes altogether trivial. But the difficulty was evaded by the supposition, that the corpuscles of pus, reaching capillaries too minute to admit of their entrance, are arrested in their progress, and excite inflammation in the surrounding tissue, which, from the nature of the cause, speedily advances to a copious suppuration; and this explanation was supported by the experiments of Cruveilhier, who found that metallic mercury, when introduced into the veins, was carried to the capillaries of the lungs, and there occasioned small abscesses, which, being opened, were found to contain a globule of the metal in their centre. But there was another difficulty in the way of this hypothesis. It often happens that large collections of pus disappear, probably by the process of absorption, without any of the evil consequences which are ascribed by the hypothesis to even small quantities entering the veins. In reply it may be said that, when pus really enters the vessels by absorption, it must have been previously disintegrated and rendered liquid; as microscopic observation has shown that no orifices exist in the walls of the vessels, by which the pus corpuscles can possibly gain admission. When thus prepared for absorption, it may be thought to have undergone changes which divest it of noxious properties. It may be only when admitted into the circulation in the form of pus that it produces the ill effects ascribed to it; and this happens not by absorption, but through openings in the veins, resulting either from ulceration or wounds. With the qualification here stated it is certainly not impossible that the metastatic abscess should take place in the manner supposed.

Phlebitis.—But another, and what seemed to many a more probable explanation, was offered, according to which the pus, found in the veins proceeding from suppurating parts, is not taken up by the vessels, but actually formed in them, in consequence of inflammation of their tissue, propagated from the original point of disease, and disposed to take on the suppurative character by the previous condition of the system. Phlebitis, according to this view, is the true source of metastatic abscess. That inflammation of the veins has not always been detected, is no proof that it may not have existed; for, in a system of parts so extensive, an inflamed surface may easily have escaped observation, more especially as the indication afforded by the presence of pus may be wanting, in consequence of this product being washed away by the blood as fast as formed.

Purulent Infection.—A third opinion, which appears to me to approach nearer the truth than either of the preceding, and which seems to be more generally accepted, is that which looks upon the affection as the result of *purulent infection* of the blood. By this expression is not meant a mere contamination of the blood by an admixture of pus, but a change effected in its essential constitution, through a poisonous action of the cause, analogous to that produced in small-pox and typhus fever, by the absorbed matter of contagion. The results, therefore, are not produced directly by the pus, but by the morbid state of the blood which it may have induced by a sort of zymotic influence. Either the pus formed in the original focus of disease undergoes a degradation by which it is brought into the condition of an absorbable sanies, or some other sanious fluid is generated by the inflammatory process;

for, as before stated, it can scarcely be allowed, in the present state of microscopic investigation, that unaltered pus can enter the circulation.* This poisonous product, being absorbed into the circulation, acts as a ferment, through which one or more of the constituents of the blood, and especially, in all probability, the fibrin, undergoes a morbid change, so as to become irritant, and thereby excite the various febrile phenomena which characterize the affection, and at the same time provoke at different points a low inflammation, leading to the exudation of morbid coagulable lymph. This, not having the vital force essential to coagulation and absorption, or to organization, is converted immediately into pus, according to principles taught under inflammation, and thus forms the abscesses denominated metastatic.†

Pyogenic Fever.—Purulent deposits are not the only phenomenon to be noticed in these cases. There is a tendency also to a low erysipelatous inflammation in various parts of the surface, not unfrequently ending in subcutaneous suppuration, and sometimes in gangrenous abscesses. There is also a train of general symptoms of the typhoid character, such as a frequent feeble pulse, hurried respiration, a somewhat leaden or jaundiced hue of the skin, and, in bad cases, a dry tongue, sordes on the gums and teeth, stupor or low delirium, subsultus tendinum, sometimes diarrhœa, and great general prostration. In many cases, there are rigors or shivering, which in some instances recur frequently though irregularly; but this is by no means an invariable symptom; and cases are not uncommon, in which no chills have been observed. Of course, too, there must be symptoms of derangement in the organs in which the abscesses are formed, as the lungs, liver, the peritoneal and pleural membranes, and more rarely the heart and brain. Indeed, there is no part of the body which may not become the seat of the purulent deposits, and of the symptoms they are calculated to provoke. The affection which the disease most resembles is enteric fever, especially when it is attended by tympanitic abdomen and diarrhœa; but it wants the red spots of that disease, and differs so much in its course that they could not be long confounded.

* This is the doctrine now generally received. As no pores can be discovered in the sides of the capillaries, with the aid of the microscope, through which objects so large as pus corpuscles can possibly enter those vessels, it is presumed that pus in its integrity is never absorbed; and that, when collections of pus disappear spontaneously, as sometimes undoubtedly happens, one of two things takes place; either the proper liquid parts of the pus are absorbed, leaving the shrivelled corpuscles crowded together in the form of a soft cheesy mass; or the corpuscles themselves undergo a fatty degeneration by which they are converted into an oily matter, that readily forms with the albuminous fluid an absorbable emulsion. But, as I have elsewhere taught, I am by no means certain that, when the capillaries are surrounded and pressed on by the pus corpuscles, openings may not be made in their walls, through the operation of pathological laws, by which the pus corpuscles may enter, and thus relieve the local difficulty. If this be true, the old idea of the absorption of pus may not be so far untenable as now generally supposed, and real pyæmia may exist. But even admitting this, the disease generally known by this name does not thus originate; for the presence of healthy pus in the blood does not produce the symptoms by which it is characterized, which can be explained, I think, only on the principle that the blood itself is poisoned, probably through the agency of some noxious agent, either resulting from the decomposition of pus, or originating some other way in the course of unhealthy inflammation. (*Note to the sixth edition.*)

† Some experiments of M. Flourens are strongly confirmatory of the views presented in the text. Some drops of pus from the dura mater of a dog were applied to the healthy pleura of another dog. At the end of 36 hours, the dog died with both pleuræ filled with pus. The blood was poisoned by the absorption of the disintegrated pus; purulent infection was induced; and the pleuræ, one of which, being already irritated, invited the afflux of the morbid action, became the seat of the exudation which so quickly took the form of pus. A similar experiment was performed on another dog; the pus being, in this instance, applied to the abdominal muscles. In four days the animal died with an enormous infiltration of pus among the different muscles of the abdomen. Had the general mass of blood not become affected through the absorption of the poison, the pus would have produced only a circumscribed and wholly localized inflammation. (*Med. T. & Gaz.*, April, 1858, p. 359.)

The same state of system precisely may take place, quite independently of any known local inflammation as its origin. I have had under my care, in the Pennsylvania Hospital, a patient with all the symptoms characteristic of purulent infection, including abscesses in various parts of the body, erysipelatous inflammation here and there upon the surface, and general typhoid symptoms, who was attacked in consequence of exposure to severe cold, great privations, and fatigue, with habits of intemperate drinking, and without any discoverable original inflammation as the starting-point; and this is by no means the only case of the kind which has come under my observation. Five cases of similar character have been recorded by Wunderlich, in which no focus of suppuration was known to exist previously to the attack, and in which, though the patients had in two instances been injured by a fall, yet nothing of the kind had occurred in the others, and two cases appeared to have originated, as in the one above mentioned which came under my own notice, in exposure to cold. (*N. Am. Medico-chir. Rev.*, July, 1858, p. 770.) Here, as well as in the cases traceable to a local point of injury or inflammation, there is a diseased condition of the blood; and, so far as symptoms and results can be admitted as proof, this condition is the same in the two varieties of the affection. In the one case, it is produced apparently by altered pus, or other sanious product of inflammation, absorbed into the veins, and setting on foot a zymotic change in the blood, especially, it is probable, in the fibrin; in the other, by causes acting through the digestive organs and the nervous system.

The same condition of things occasionally follows febrile diseases, such as scarlet fever, typhoid fever, and small-pox. I have witnessed a case of the last-mentioned disease, in which, during apparent convalescence, the patient was attacked with this disease, with the formation of vast purulent collections, so that the body seemed as if it would dissolve into pus. Dysentery and enteritis, attended as they often are with an ulcerated state of the bowels, are liable to intercurrent attacks of the disease; and the deposits of pus sometimes found in the liver, after death from the former affection, are thought by some to depend not so much on proper hepatitis, as on purulent infection of the blood proceeding from the sanies absorbed from the ulcerated surfaces. In the course of endocarditis, arteritis, and suppurative phlebitis, states of system very similar to that of purulent infection occasionally come on, which may have a similar origin; the poisonous matter being in these cases generated within the circulation, instead of being absorbed into it from without. The low febrile affection, occasionally attacking puerperal women, is probably of the same character with that here described; originating in the absorption of sanies generated in the injured uterus.

These cases of metastatic abscess, purulent infection, or pyogenic fever are very apt to prove fatal; but they are by no means necessarily so; and in the milder forms often end in recovery.

Treatment.—There is an obvious propriety in the use of stimulants in this disease, which, however, should be graduated to the degree of debility, and used in moderation unless strongly called for by evident prostration. Quinia, the alcoholic liquors fermented or distilled, carbonate of ammonia, and the ethereal preparations, have been most relied on. The diet also must be nutritious and supporting; and ventilation should be carefully attended to. In short, the treatment is identical with that already amply detailed as adapted to low states of fever. But there is also a strong indication for the use of alterative remedies, calculated to change the condition of the blood. The mineral acids are useful as tonics; but, in addition, the nitromuriatic acid has properties which adapt it peculiarly to meet this indication. It has, indeed, in connection with the requisite supporting measures, been my main reliance in this complaint. But other alteratives which may be very properly tried are chlorine ater, tincture of chloride of iron, and solution of permanganate of potassa. ecently the bisulphite of soda has been employed, under the impression that e affection is essentially zymotic, and that the fermenting process in the lood might possibly be corrected by the same agents which are known to be ncompatible with it out of the body. Two cases have been communicated by r. W. F. Atlee, of this city, to the *Am. Journal of the Med. Sciences* (Jan. 865, p. 52), in which recovery took place under the use of this remedy; eight rains having been given every four hours in one case; and twenty grains every wo hours in the other, during the period of greatest danger. The tincture of conite root is said to have effected cures in several cases of purulent infection, iven in the quantity, during the twenty-four hours, of from 5 to 10 grammes 77 to 184 grains). (*Annuaire de Thérap.*, A.D. 1862, p. 19.) The preparaion here referred to was made with equal proportions of alcohol and the fresh oot, and must have been quite equal in strength to our officinal tincture. It ould be safest to commence with a dose not exceeding from five to ten drops, requently repeating it, and gradually increasing to the amount recommended, hould the patient be found to bear it.

Article IV.

LEUCOCYTHÆMIA.

Syn.—*Leukæmia.* (Virchow.)

THE name leucocythæmia, signifying *white-cell blood* (λευκος, white, κυτος, ell, and αἷμα, blood), was given by Prof. Bennett, of Edinburgh, to a peculiar orm of anæmia, characterized by the presence in the blood of a great excess f the white or colourless corpuscles, readily distinguished from the blood-disks y their spherical shape, greater size, and granular aspect, and by the exhibiion of nuclei when treated with acetic acid. Two cases of the disease were escribed in the *Edinburgh Medical and Surgical Journal* for October, 1845, ne by Prof. Bennett, and the other by Dr. Craigie, in which, though the exess of white corpuscles was observed, they were considered as pus corpuscles; nd the affection was regarded by Prof. Bennett as suppuration of the blood. n the following month, Prof. Virchow, of Berlin, began a series of commuications in a German journal, in which he described several cases of the affecion, and first put forth the opinion that the corpuscles referred to were really he white corpuscles of the blood. Considering the associated symptoms to chaacterize a peculiar disease, he gave to it the name of *leukæmia* (from λευκος, hite, and αἷμα, blood). Subsequently Prof. Bennett published, in different umbers of the *Edinburgh Monthly Journal of Medical Sciences*, for the years 851 and 1852, and in a distinct Treatise, an elaborate account of the disease, llustrated by many cases; adopting Virchow's views of its nature, but substiuting for the name proposed by him, that given at the head of this article, as ore accurately expressing the nature of the affection, which is not characterzed by *white blood*, but by an *excess of white cells in the blood.**

In this form of anæmia, the surface is usually strikingly pale, and a dispoition to œdema exists. In all the cases hitherto observed, the affection has een associated with structural disease of one or more organs, upon which it probably depended; as, whenever an opportunity has been offered to make the requisite investigation, it has been found that the excess of white corpuscles did not begin to appear, until after the local lesion had been for some time in existence. Of these associated affections *enlargement of the spleen* is the most common, having, indeed, been noticed in almost all the cases. In many the liver is also enlarged, and not unfrequently the lymphatic glands. I believe that no case has been observed, in which either the spleen or the lymphatic glands were not diseased; and the instances are very few in which the latter were exclusively affected. Disease of the spleen, therefore, is the chief source of the affection of the blood. This organ is sometimes enormously enlarged.

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* Virchow, admitting that the blood is generally red, states that, in consequence of he adhesiveness of the white corpuscles, they are apt, upon the cessation of the moveent of the blood at the time of death, to coalesce, especially in the right side of the eart, so as sometimes to give the blood almost the aspect of pus; and, even during life, stream of blood from the arm occasionally exhibits whitish streaks. (*Cel. Pathol.*, Am. d., p. 202.)

The complaint has usually a very slow march, lasting for years, and in some instances for many years, before the fatal termination. Beginning insidiously, it has often existed for a long time before attracting notice. With a gradually increasing anæmia, it is, in most instances, attended with disorders of the respiratory and digestive functions, as dyspnœa, diarrhœa alternating with constipation, vomiting, œdema of the extremities, ascites, jaundice, &c.; some depending immediately on the splenic or hepatic disease, others on the state of the blood. In the latter category is probably the dyspnœa, which is often a prominent symptom. In some cases, there is fever with evening exacerbations, and a tendency to assume the hectic character. In others, hemorrhage, especially epistaxis, is a more prominent symptom, and is a source of great danger, exhausting the strength by its frequent recurrence, and sometimes causing immediate death by its abundance. Occasionally it occurs in the brain, and proves fatal, with apoplectic phenomena. Generally, however, death takes place, as the result of a slow and gradual failure of the vital powers in an extreme state of marasmus. The disease is almost always sooner or later fatal, though not without periods of apparent amendment in its course. In those cases which have not ended in death, the result does not seem to have been positively determined in any instance. Virchow states, in an article on the subject, published in 1856, that there had been no well-authenticated instance of recovery. I have had three cases of the disease, one of which apparently recovered,* the second terminated fatally, and the third passed from under my are little altered. In all, the spleen was greatly enlarged. It is not improbable that the disease may exist to a considerable extent in the miasmatic districts of this country, where disease of the spleen abounds; but I have ascertained, by observation, that it is not an ordinary complication of that form of anæmia with enlarged spleen, which so frequently attends or follows miasmatic fevers.

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* This patient was a lad about seventeen years of age, who came to the Pennsylvania Hospital from sea, having been in the West Indies, and on the coast of North Carolina. We could not learn from him that he had been affected with intermittent or remittent fever. He was extremely anemic, with edematous limbs, and very feeble. The spleen was enormously enlarged, and the abdomen tumid. Dr. Addinell Hewson, one of the resident physicians of the hospital, examined the blood, and found it to abound in the white corpuscles. Not less than thirty were visible in a portion of diluted blood in the field of the microscope. The patient was put upon the use of sulphate of quinia, the pill of carbonate of iron, and rich animal food. His general health rapidly improved, the spleen grew less, the dropsical symptoms quite disappeared, and he became florid and full under the treatment. But the white corpuscles were little diminished; and it was soon noticed that, though the spleen had shrunk nearly to its normal size, the liver had become greatly enlarged, and was somewhat painful on pressure. Attributing the hepatic affection to excess of stimulation from the medicine and rich food, I directed the quinia and iron to be omitted, small doses of the blue mass to be administered, a blister to be applied over the liver, and the diet restricted to vegetable food. Under this plan, the liver was soon much diminished, but the spleen again increased in size, and the anemic symptoms began to reappear, with a somewhat mottled and purplish hue of the surface. As the gums were slightly affected by the blue pill, this was omitted, nitromuriatic acid was substituted, a blister applied over the spleen, and a milk diet directed. His health now rapidly improved, and the spleen and liver were both gradually reduced in size; but, as he continued anemic, the acid was omitted, and the pills of carbonate of iron, with a full diet, were ordered. Under this treatment he continued steadily to amend, and at length was restored to perfect health, with a good colour, strong, fleshy, and free, so far as could be ascertained, from splenic or hepatic disease. The proportion, moreover, of the white corpuscles gradually diminished, and, when the blood was last examined, it exhibited only two or three in the field of the microscope, where thirty or more had been previously seen. He was dismissed

The blood during life has the ordinary red colour; but, when defibrinated and allowed to stand, it deposits first the red and afterwards the white corpuscles, the latter of which form upon the surface of the former a yellowish-white layer, of the appearance of pus. This quality of leucocythemic blood serves to distinguish it from the so-called *chylous blood*, in which the liquor sanguinis has a milky appearance, in consequence of an excess of fat, and which, upon standing, after defibrinization, instead of depositing pus-like matter, sends to the surface a creamy layer. After death, soft yellowish or greenish coagula are found in the right cavities of the heart, distinguishable from the fibrinous coagula of phlebitis by the absence of adhesions, and by being separable, by agitation with water, into the white corpuscles which render the liquid milky, and into a clot of fibrin. (*Virchow.*) The characteristic condition of the blood is a great diminution in the proportion of red corpuscles, and a very great increase in that of the white. Instead of one of the latter, to between 300 and 400 of the former, which is about the normal proportion, the blood in this affection contains, according to Dr. Pavy, one of the white to 21, 12, or 17 of the red, and, in a case seen by Vogel, the proportion was increased to 1 to 2. (*Arch. Gén.*, Fév. 1856, p. 130.) Virchow mentions an instance in which two out of five of the corpuscles were white. The blood of leucocythæmia differs from that of simple anæmia by its great excess of white corpuscles; and from that of inflammation, in which the proportion of these corpuscles is said to be increased, by its deficiency in red corpuscles, and its normal proportion of fibrin.

MM. Charcot and Vulpian found in leucocythemic blood after death, 1. red globules of unequal size, some having not half the normal diameter; 2. two kinds of white corpuscles, one nucleated, the other without nuclei, as large as the former, and containing many granules; 3. numerous amorphous granules; and 4. peculiar organic crystals, not visible till some time after death, colourless, of the shape of elongated octahedra, insoluble in cold but soluble in water of 140° or 160° F., not dissolved by alcohol hot or cold, nor by ether, chloroform, or glycerin; but soluble in alkaline solutions, and in most of the acids except the nitric. These crystals were found also in the spleen and liver. (*Bost. Med. and Surg. Journ.*, Feb. 1861, p. 45.) Similar crystals were found at an earlier period, under similar circumstances, by Dr. J. C. White, of Boston, who proposed for the principle composing them the name of *leukosin*. Though in all their other reactions similar to those discovered by MM. Charcot and Vulpian, they differed in being insoluble alike in cold and hot water. (*Ibid.*, March, 1859, p. 92.) Scherer has detected in the blood of this disease, formic, lactic, and acetic acids, hypoxanthin, a principle analogous to xanthic oxide, and gluten (*Ibid.*); and Prof. Oppolzer, the same acids, together with tyrosine, leucine, and traces of uric acid. (*Arch. Gén.*, Mai, 1859, p. 613.)

Though always associated with disease of the spleen or lymphatic glands, the change in the blood bears no special relation to the degree of the organic lesions. Nevertheless, the prevalent opinion as to its cause is, that it depends upon an influence exerted on the blood by the diseased organs, which

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from the hospital, after having been under treatment 59 days. A particular account of the case has been published by Dr. Hewson, who made all the microscopic observations. (See *Am. Journ. of Med. Sci.*, N. S., xxiv. 365.)

consume the red corpuscles as it passes through them, and supply their place by the production of an increased quantity of the white. In favour of this view is the fact, said to have been proved in relation to the healthy spleen, that the blood, upon leaving it, is poorer in the red and richer in the white corpuscles than when it entered; showing that its influence in producing leucocythæmia is only an exaggeration of its healthful action. Still further confirmatory of the view is the statement of Virchow, that, in the cases connected with diseased lymphatic glands alone, he found the blood, instead of well-developed cells, conforming to those of the spleen, as in ordinary cases of the disease, to contain innumerable round granular nuclei, analogous to those found in the parenchyma of the lymphatic glands. (*Arch. Gén.*, Fév. 1856, p. 182, from *Gesammt. Abhandl. zur Wissenschaft. Medicin.*)

In his work on *Cellular Pathology* (Am. ed., p. 201), Virchow proposes for the variety of the disease connected exclusively with diseased lymphatic glands, the name of *leucocytosis;* but as, according to his own statement, the two affections are often combined, and as there seems to be no material difference in their symptoms or results, it appears to be a needless refinement to separate them. In that work he speaks of the peculiar elements in the blood of leucocytosis, as small cells, with nuclei large in proportion and single, somewhat granular, and so closely attached to the cell-wall that often this cannot be demonstrated; and he appears to have no doubt of the origin of these minute bodies in the lymphatic glands.

The spleen is sometimes enormously enlarged. Dr. J. W. Begbie describes a case in which it weighed eleven pounds. (*Ed. Med. & Surg. Journ.*, June, 1863, p. 1140.) According to various observers, when cut, it exhibits the corpuscles of Malpighi greatly enlarged, with a substitution of a white granular infiltration in the parenchyma for the normal red colouring matter, and a similar change in the capillaries leading to and from them. (*Ibid.*, Jan. 1860, p. 666, from *Gaz. Méd.*)

The idea is not without plausibility, that the disease is, as Prof. Bennett originally imagined, a kind of suppuration of the blood. In the first place, the general symptoms are of a character to render this not improbable; and secondly, according to M. De Chaumont, the corpuscles are affected in the same manner as pus corpuscles by chloroform, which clears them up and brings the nuclei into view, while it has no effect on the white corpuscles of the blood. (*Ed. Month. Journ. of Med. Sci.*, May, 1853, p. 470.)

As to the treatment of leucocythæmia, little need be said. As nothing hitherto done can be asserted to have effected cures, the practitioner is thrown on his own resources, and must use the measures which seem, in his best judgment, to be indicated by the appreciable morbid conditions. In a note upon *page* 286 will be found the measures employed by the author in a case which appeared to end favourably, but in which he has been unable to verify the persistence of the cure.

Article V.

SUPRA-RENAL CACHEXIA.

Syn.—*Addison's Disease.—Bronzed-skin Disease.—Supra-renal Melasma.*

THE name at the head of this article is adopted provisionally, to be superseded when a better can be found. It indicates two prominent characters of the disease; the cachectic state of the system, and the morbid condition of the supra-renal capsules. The name of *Addison's disease* was given to it in nour of the discoverer; that of *bronzed-skin disease*, as expressive of one ' its most striking, though not positively essential phenomena. I place it nong the blood diseases; because it is obvious that most of the symptoms, d probably the result, depend upon the state of that fluid.

To Dr. Thos. Addison, of Guy's Hospital, London, belongs the undivided edit of having discovered this affection. Having noticed various instances ' a peculiar discoloration of the skin, connected with an anemic or cachectic ate of system, which sooner or later almost invariably ended in death, and ving, on post-mortem examination, found, as a constant attendant on these enomena, some organic lesion of the supra-renal capsules, often without any her discoverable lesion whatever, he felt himself justified in considering these veral morbid conditions as having an essential connection, and as constituting distinct affection. His conclusion has been generally received by the profesn; and, whatever difference of opinion may exist as to the connection beeen the associated phenomena, few if any refuse to admit the new claimant to the category of diseases.

As defined by Addison, it is a peculiar form of anæmia, characterized by eat general debility, feebleness of the pulse, and irritability of stomach, and sociated with brown discoloration of the skin, and disease of the supra-renal psules. It was supposed by him that the disease of these bodies might be rious; all that was essential being so much structural change in the organ to unfit it for the performance of its functions. But more extended observan has convinced those pathologists who have paid most attention to the bject, that it is only one special form of organic disease in the supra-renal psules that is connected with the newly discovered disorder; and that, though hers may exist in them even to the destruction of life, as cancer, for exame, these are not associated with that peculiar form of anæmia, and that peliar discoloration, which give character to the affection.

Symptoms.—The complaint usually begins insensibly, and is very slow in its ogress, often running on for months before it is recognized; but sometimes is much more rapid, and ends fatally in a few weeks from its commencement. is difference is ascribed by Dr. Addison to the more or less rapid developnt of the supra-renal disease. The first observed symptoms, omitting for e present the consideration of the colour of the skin, is a remarkable degree languor or weakness, with an indisposition to exertion, whether bodily or ntal. The pulse is usually small, sometimes full, but always feeble; and, ough it may be occasionally excited, is commonly normal in frequency. The petite is diminished or lost; there is uneasiness or slight pain at the epigasum or in the hypochrondria; and nausea and vomiting are sometimes pronent symptoms. The bowels are usually inclined to costiveness; but are metimes affected with diarrhœa. The patient loses flesh, but not in proporn to his increasing weakness; and the emaciation is much less striking than other wasting diseases, such as phthisis and carcinoma. It is rather a flabness or relaxation of the tissues than a positive wasting. Aching in the ck and loins is complained of by many patients. There is sometimes more less cerebral disorder, indicated by loss of memory, feelings of numbness, mness of vision, vertigo, and convulsions; and near death there may be a ndency to incoherence or delirium; but these symptoms are not general. rts of the surface not discoloured have an unhealthy paleness; the tongue is an and pale; and the white of the eye is remarkably clear and pearly. The in is usually soft and cool; and the urine and biliary secretions normal; and, most cases, nothing is to be found in the heart, liver, kidneys, lungs, or any her organ open to examination, which can explain the phenomena.

With these constitutional symptoms there is a remarkable discoloration of e skin; at first of a dingy sun-burnt hue, but darkening into some shade of "deep amber or chestnut-brown." (*Addison.*) Mr. Hutchinson described it as bearing a close resemblance to the colour of a bronze statue from which the gloss has been rubbed off; and the term *bronzed* is now generally applied to the discoloured skin in descriptions. When the colour is uniformly diffused, the patient, though white before, has very much the appearance of a mulatto. Sometimes it appears in ill-defined patches, with lighter coloured or even pale portions of skin between, giving to the surface a mottled aspect. It is, however, rare that the skin is anywhere perfectly free from discoloration. In other instances, it is uniformly diffused over large portions of the surface. It is generally most "strongly manifested on the face, neck, superior extremities, penis and scrotum, axilla, and around the navel." Surfaces that have been blistered, or otherwise injured, are, after the restoration of the cuticle, similarly affected. Black stains on the lips are spoken of as constituting an important diagnostic character; and patches of the same kind have been observed in the mucous membrane of the mouth. The colour of the skin is not affected by pressure. The circumstance that the discoloration is disposed to show itself especially where there is naturally a large proportion of pigment cells, as around the nipples, and does not appear where these are wanting, as in the palms of the hands and the matrices of the nails, would seem to prove that it is owing to the deposition in the skin of an excess of the normal pigment matter. (*Med. T. and Gaz.*, March, 1856, p. 281.) In its general character the discoloration has been observed to resemble more the natural hue of the coloured races of men, than any that ordinarily arises from disease; and it is said that, in some instances, the change of colour has been accompanied with the odour characteristic of these races. This strengthens the opinion, that the disease of the surface is rather an augmentation of a healthy function than an altogether new action in the skin. When examined by the microscope, the rete mucosum is seen to contain a layer of pigment, as in the darker races. (Wilkes, *Guy's Hosp. Rep.*, A.D. 1862, p. 13.)

With the duration of the disease, the symptoms above enumerated undergo aggravation; the languor and weakness are extreme; the appetite is quite lost; dyspnœa, frequent sighing, palpitations, and a tendency to faintness often occur; and the pulse becomes more and more feeble, till at length the vital actions gradually fail, and the patient dies. Occasionally, however, death occurs suddenly and unexpectedly. Sometimes typhoid symptoms precede death, and sometimes convulsions. The duration of the disease is very variable. It may be for months or for years. In a statistical table of 37 cases, the shortest period given is eight weeks, the longest four years and a half. (Hayden, *Dub. Quart. Journ.*, Feb. 1865, p. 82.) Dr. Wilkes mentions six months and five years as the extremes under his observation, and gives the mean as one year and a half. (*Guy's Hosp. Rep.*, 1862, p. 17.)

Diagnosis.—The association and march of symptoms above described are unlike those of any other disease. Even without the discoloration of skin, the affection is sufficiently marked to be distinguished; and Dr. Addison mentions a case of the kind as having occurred at Guy's Hospital, and to have been proved to be such on examination after death. (*Med. T. and Gaz.*, Feb. 1858, p. 203.) From almost all other cachectic affections, this is distinguished, independently of the colour, in the first place by the absence of any discoverable source of the phenomena, and secondly by the relatively moderate degree of emaciation, considered in connection with the other symptoms, and with the march and termination of the disease. The colour, as it first appears, might be mistaken for that of a *sunburnt skin;* but it is seen also in parts covered by the clothing. The hue in *Pityriasis versicolor* bears considerable resemblance to it; but the patches of this affection are more defined; it yields readily to remedies; and the furfuraceous character of the surface, and the presence of a fungus visible under the microscope, leave no room for doubt. The colour in *jaundice* is sometimes not unlike that of the disease in question; but in the former the sclerotica always participates in the discoloration, in the latter is remarkably clear and pearly. Another character by which it is distinguished from other morbid discolorations is the want of a definite outline between the different shades; the deeper gradually passing into the lighter; and seldom or never being separated by an abrupt outline, such as is generally observable in affections of the skin. The dark patches on the lips and the buccal mucous membrane are also highly characteristic.

Anatomical Characters.—In all the cases observed by Dr. Addison,* and in all which were subsequently collected from various sources and tabulated by Mr. Jonathan Hutchinson,† amounting to at least 27, whenever a post-mortem examination was made, the supra-renal capsules were found more or less diseased, and, in not a few cases, were the only organs that were diseased. The affections of the capsules were various; in some instances simple inflammation and suppuration, in others atrophy with fibro-calcareous concretion, in a third set fibroid degeneration with induration and enlargement, in a fourth tubercle, and in a fifth carcinoma. Fatty degeneration, and cystoid disorganization have since been added to the list. In some instances, the disease of the capsules was secondary; in others, original and exclusive. These facts appeared sufficient to establish a fixed relation between the disease of the capsules and the cutaneous discoloration; especially when supported by another important fact, that, out of 500 post-mortem examinations made in Guy's Hospital in the years 1854 and 1855, there was only one instance of disease of these capsules noticed in which there was no discoloration of the skin; and in that one, only a few malignant tumours grew from the surface of the organ. (*B. and F. Medico-chirurg. Rev.*, Oct. 1856, p. 319.) Subsequent observation, however, has given somewhat different results; and, as already stated, the prevalent belief at present is, that the disease of the supra-renal capsules is always of the same distinctive character, though presenting different appearances in different stages. Dr. Wilkes states that he has never known these organs to be affected in any case of the disease with cancer, melanosis, degeneration of tissue, or any other deposit than the one which is characteristic. (*Guy's Hosp. Rep.*, 1862, p. 18.) If the patient has died in an early stage, the capsules, which are somewhat enlarged, appear when cut into to have been changed into a translucent, grayish, rather soft, homogeneous substance, which, when examined microscopically, is found either structureless, or, in some instances, slightly fibrillated, with a few abortive nuclei or cells. This is the form in which the new matter appears to be originally deposited. At a later period, it undergoes a kind of degeneration, by which it is gradually changed into an opaque, yellowish, cheese-like substance, which is mixed in less or greater proportion with the original deposit. Still later, this yellow caseous matter is found to have undergone further changes, and either to have become a soft, semiliquid putty-like material, or to have been absorbed, leaving a chalky substance behind. (*Ibid.*, p. 19.) These are characters and changes so closely allied with those of tuberculous infiltration, as it often occurs in the lungs, as to suggest irresistibly the idea of a similar origin. The microscope, however, has not revealed the existence in this substance of the characteristic structure of tubercle; and, in the present state of our knowledge on the subject, we can go no further than to admit a close analogy with tuberculous disease. It would seem that, in this instance, a substance is thrown out of a still lower grade of vitality than in proper tuberculosis; exhibiting but the slightest evidences of an attempt at organization;

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* On the Constitutional and Local Effects of Disease of the Supra-renal Capsules. London, 1856.

† *Medical Times and Gazette*, March, 1856, p. 281.

and, as in the other affection, indicating either a depression in the vital forces of elimination and organization in the part affected, or a defective character in the blood from which it was eliminated. The diseased capsules are often surrounded with a dense fibrous tissue, and not unfrequently have contracted firm adhesions to the neighbouring organs, as the kidneys, liver, &c.; no doubt owing to inflammation excited by the pressure of the foreign matter, as tubercle causes inflammation in the pulmonary parenchyma.*

Besides the enlarged supra-renal capsules, there is often also found, on post-mortem examination, an unusual development both of Peyer's glands, and of the solitary glands in the bowels, and sometimes considerable congestion of the intestinal mucous membrane.

Nature.—Of the character of the connection between the discoloration of the skin and the capsular disease several views may be taken. 1. The connection may be simply accidental. This would seem most probable, had it occurred only in a small number of cases. But the coincidence has been so frequent as to render such an explanation altogether inadmissible. It is true that, since the publication of Mr. Hutchinson's paper, several instances have occurred, in which great disease of the capsules existed without the discoloration; but in most of these the local disease was of a different nature from that specially belonging to this affection; and the number is very small in which this characteristic deposit has been discovered, without the change of colour. Still, two at least of this kind have been recorded; and it must be admitted that the connection between the capsular and cutaneous affection is not absolutely essential. But it appears to me an unavoidable inference from these facts, that the coincidence is not merely accidental. 2. It may be said that the disease of the capsules and the skin may depend on some common but hidden cause. This cannot be denied; yet can scarcely be admitted in the absence of all proof. 3. The relation between the two conditions may be that of cause and effect. But that the discoloration of the skin could have produced the supra-renal disorder, is so contrary to all experience in relation to analogous affections that the idea could be accepted only upon irrefragable proof; and the fact, already stated, that the supra-renal disease has existed without the discoloration proves that it must have had some other cause. It follows, therefore, that the disease of the supra-renal capsules must have directly or indirectly caused that of the skin. That we cannot understand how the effect is produced is no argument against the fact. I cannot see how any other conclusion can be drawn from the foregoing facts and considerations than the one here arrived at. Against it, however, the cases have been adduced in which disease of the capsules existed without bronzing. Throwing out of view those organic affections of the capsules, as cancer, fatty degeneration, simple inflammation, &c., which are admitted, at present, to have no connection with the bronzing, there still remain the few cases in which the proper capsular affection has existed without the discoloration. Two explanations have been offered; one, that the discoloration does not come on until at a somewhat advanced stage of the capsular affection; and, in one of the cases referred to, the deposit found in the capsule was in the grayish and translucent condition characteristic of the early stage, so as to give colour to this suggestion. The second explanation is based on the supposition, that it is not the capsules themselves which directly produce the discoloration, but that they act by deranging certain nervous structures which may have the pigmentary function under their control; and that, when the colour is not changed, the result is to be ascribed to the immunity of the nerve centres in that particular instance.

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* For a particular account of the minute anatomy of the supra-renal capsules, prepared apparently with great care, by Dr. Geo. Harley, see the *Lancet* (Am. ed., Aug. 1[illegible], p. 109).

Upon the whole, it appears to me that a positive relation of cause and effect has been made out to exist between the cutaneous and capsular affections, and that the latter is, at least in the great majority of cases, the cause of the former. But admitting this, it does not follow that other organs may not produce a similar effect. This has, indeed, been conjectured of the pituitary gland. Dr. Gull has found considerable analogy in structure between this gland and the supra-renal capsule; and in a case of death with bronzed skin, in which there was no disease of the latter structure, he found the pituitary gland considerably deranged. (*Lancet*, Am. ed., July, 1857, p. 61.)

Theory of the Disease.—It has been imagined that the supra-renal capsules, which have hitherto been overlooked physiologically, have some important function in the animal economy, upon a failure of which the digestive and assimilative processes suffer, imperfect blood is produced, the pigment matter is excessively deposited in the skin, and a general prostration at length ensues incompatible with life. In what manner they exercise this influence, it is not pretended to decide. The conclusion is based exclusively on observation. But a strong resemblance has been supposed to exist between the structure of these organs and the nervous centres; and the idea has been advanced that they might preside, in a similar manner, over the organic functions, possibly in co-operation with the sympathetic system. To the opinion of their importance in the economy some strength was given by the experiments of M. Brown-Séquard, who found death to result within a few hours in the lower animals, when these bodies were extirpated. But the effect of these experiments has been weakened, if not nullified, by others more recently performed by Dr. George Harley, of London, who has removed the supra-renal capsules from cats and rats, in several instances, without serious consequences; and believes that the fatal results, in other instances, are to be ascribed mainly to injury of the solar plexus in the vicinity of this organ. This anatomical fact has suggested an explanation of the etiology of the general disease, as well the cachectic condition as the discoloration, which is highly plausible. It is scarcely probable that the supra-renal capsules can hold so vastly important a position in the system, as would be implied in the admission that they are the direct agents in the production of a disease so fatal as that of supra-renal cachexia. The solar plexus and semilunar ganglia lie in such near contiguity to the capsules that they might readily be conceived to suffer in the diseases of the latter organ. Indeed, branches of nerves from these centres have been traced into the substance of the diseased glands, and even the semilunar ganglion has actually been found incorporated in the tumour. Now the influence of these nerves is known to be highly important; and, though no proof exists that they so far preside over the blood-making functions as to justify the inference that their diseased condition must necessarily fatally impair the condition of the circulating fluid; yet, when we consider the control which the sympathetic centres are known to exert over the capillary circulation everywhere, we can readily admit that the various blood-producing organs may suffer greatly in their functions from derangement of these centres; and, as the proper elimination of the cutaneous pigment from the blood may be similarly dependent on a proper condition of the capillary circulation, it is as easy to suppose that disorder in the sympathetic nerves may derange this function also. The great irritability of stomach which frequently attends the disease, and is sometimes one of the most prominent symptoms, finds a ready explanation in this association of the capsular disease with disturbance in the nerve centres.

Causes.—We are wholly ignorant of the causes of this disease, unless it be considered of a tuberculous character. In this case, the same causes which give rise to the development of tubercles elsewhere, may produce the effect here. Hence the great importance of determining this point if possible. The close analogy between the morbid deposit in the capsules and tuberculous infiltration in the lungs has been already referred to, and is the strongest argument in favour of this view of the nature of the disease. But there are also other considerations of a similar bearing. From Dr. Hayden's table, already referred to, it appears that of 37 cases, 21 were between the ages of 20 and 40; the remaining 16 cases being distributed throughout the remaining 40 years of life from childhood to 60. In other words, the disease is most prevalent at the same age with phthisis. The disease most frequently associated with that of Addison is, moreover, beyond all comparison, the tuberculous in one or another of its forms. Thus, in the 37 cases above alluded to, 13 are mentioned as being complicated with tubercle; and probably the number would have been increased by a close examination. (*Dublin Quart.*, Feb. 1865, p. 82.) Strumous disease of the spine has also been noticed in several cases. The weight of evidence is, therefore, greatly in favour of the view which considers the supra-renal cachexia as essentially a scrofulous affection. I have alluded to the influence of age in reference to the etiology of this disease. From the table of Dr. Hayden it would appear that sex has some influence, the proportion of males to females being as 26 to 11. In relation to the cause of the disease, it may also be stated that any depressing influence has a tendency to develope it when latent.

Prognosis.—This is extremely unfavourable. No well-developed case has, I believe, been known to terminate in health. In one case, a "dirty-brown tinge" of the skin, which appeared suddenly, and disappeared after a month, can scarcely be considered as an exception to the general rule. But I cannot think that the affection is necessarily incurable, if recognized and treated in its earliest stage. Admitting, as seems extremely probable, that the disease of the supra-renal capsules is of a character identical or analogous with the tuberculous, we have reason to hope that, by early attention to the state of the health, we may institute measures calculated to correct the diathesis and prevent the further progress of the deposition; and, even in the somewhat more advanced stages, much may be done to prolong life and increase the comfort of the patient. It has been observed that there are occasionally tendencies to remission in the disease, followed by exacerbations; and this fact is somewhat encouraging in a therapeutic point of view.

Treatment.—With our somewhat improved views of the nature of this disease, we have the basis of a rational practice. In the former edition of this work, published at a time when the belief prevailed that any organic disease of the capsules might be at the foundation of the cachexia, and of course inflammation among others, I suggested a plan of treatment, which I freely admit would be inapplicable to the disease, if, as there is now reason to suppose, it is analogous to tuberculosis. As all measures hitherto employed have proved inefficient towards a cure, we are thrown off of the basis of experience upon that of principle. The indications appear obvious, *first*, to prevent as far as possible the further deposition of foreign matter in the capsules; *secondly*, to support the strength under the exhausting influence of the disease; and, *thirdly*, to correct any existing disorder of function, and thereby to render the patient as comfortable as circumstances will permit, and perhaps prolong his life. Happily, the first two indications are fulfilled by the same means; such, namely, as are best calculated to invigorate the general health and improve the character of the blood. For the individual measures, the reader is referred to the constitutional treatment of phthisis. It will be sufficient here to mention that they include tonics, alcoholic stimulants so far as necessary to counteract prostration, nutritious and easily digested food, fresh air, and exercise so far as may be compatible with the condition of the diseased organs. Chalybeates and cod-liver oil would probably be among the most efficient tonics, ale or wine, or in the lowest states of the system a little brandy, the most appropriate stimulant. The mineral acids might sometimes be found useful, and especially the nitromuriatic, should there be deficient action of the liver, or an offensive breath. Citrate of iron, in an effervescent form, has been recommended as especially applicable to cases in which the stomach is irritable. To meet the third indication, remedies must be selected in accordance with the special disorder of function presented; and the anodyne narcotics, nervous stimulants, alteratives, laxatives, and aromatics, may be drawn upon at the discretion of the practitioner. For the measures required by the irritation of stomach, the reader is referred to the article on nausea and vomiting in the first volume.

Article VI.

COAGULA IN THE BLOOD.

Syn.—*Thrombosis.* (Virchow.)

Most of the facts contained in this article are noticed, more or less fully, in different parts of the work, in connection with diseases to which they are specially related. But the subject has recently attracted so much attention, and is in itself so important, as to merit a separate consideration; though there is scarcely sufficient unity of morbid action in the several affections to be noticed, to entitle them to be considered as constituting strictly one special disease. Virchow thinks differently, and, adopting the name *thrombus,* from the Greek, for the clot or coagulum, dignifies the general condition of which it is one of the characters with the title of *thrombosis.*

1. *Anatomical Characters.*—Coagula may occur in the heart or the blood-vessels, and on either the arterial or venous side of the circulation; in fact, wherever there is liquid blood out of which they may be formed. They are probably, however, most frequent in the heart, the valves of which, especially those of the left side, are their favourite seat. In form, they are extremely various, sometimes being a simple layer on the surface of the lining membrane, sometimes rising from it as roundish or irregular excrescences, and often in masses, either shapeless, or moulded by the cavity in which they lie, and to the walls of which they almost always adhere. They are of all sizes, from that of a pin's head or less, to a magnitude nearly sufficient to fill one of the cavities of the heart, or large portions of one of the great arteries or veins. They vary in colour from the redness of the blood to whiteness, and, in consistence, from an almost diffluent softness to a considerable degree of firmness and tenacity. They may contain all the ingredients of the ordinary clot of blood formed out of the body; but generally have less of the red corpuscles; and often consist exclusively of fibrin and the white corpuscles. They usually have a somewhat laminated arrangement, as if formed by successive layers. In the vessels, they may line the inner surface more or less thickly, still allowing the blood to flow, or may fill up the caliber completely, so as to arrest the circulation. In the former case, they are apt to increase by new accretions in the direction from the heart, in the latter they advance in a similar manner towards the heart, until they reach the nearest bifurcation, when they terminate with a rounded extremity, which, in the veins, according to Virchow, projects somewhat into the main trunk, and floats loosely in the current of the blood.

In most instances, they commence as a layer on the inner surface of the heart or vessel, whether by deposition of fibrin from the blood, or by exudation from the vasa vasorum, has not been determined; though probably sometimes in one way, and sometimes in the other. Not unfrequently, also, they appear to be formed about a nucleus, which may itself be a portion of a fixed clot, broken off and carried to a new site. In either case, they increase by successive additions of coagulated blood or fibrin.

After their formation, they undergo various changes, being sometimes organized, and ultimately converted into a kind of ligamentous tissue; in other instances, becoming softer or harder, undergoing a fatty or calcareous conversion, or breaking up, especially when the blood is diseased, into a kind of puruloid matter. Not unfrequently, in all probability, they are dissolved in the blood, and washed away with it, leaving the vessel permeable.

2. *Causes.*—The condition which is thought to be most favourable to the formation of coagula is a stasis of the blood, either general or local; and, in proportion as the movement of the circulation is more or less completely suspended, is the greater or less tendency, other things being equal, to their generation. Hence the disposition to the production of the heart-clot in the last stage of life, or in extremely prostrate states of the system, when the blood almost stagnates in the ventricles. Whatever locally arrests the circulation favours the coagulation of the fibrin in the vessels. Suspended movement through the capillaries must have this effect on the blood in the vessels behind them. Inflammation; gangrene; the pressure of tumours; the induration or contraction of tissue; the enlargement of organs, whether normal, as in the gravid uterus, or abnormal, as in diseased liver and spleen, may all act in this way. The slow or arrested movement of the blood in aneurismal cavities is probably the chief cause of the coagula contained in them.

The condition of the blood is another cause, which is sometimes alone sufficient to produce the effect; and very much favours the influence of the one just mentioned. A relative excess of fibrin in the blood, or excess of its contractility, as in acute rheumatism, some cases of anæmia, and the pregnant and puerperal states, strongly conduces to the result. Mr. Paget has suggested the presence of urea in the blood as a cause; and Dr. Lee and others consider that pus in the circulation may have the same effect; but both these opinions are doubtful. In Bright's disease, when urea accumulates in the blood, there is also frequently a cachectic condition, associated with deficiency of the red corpuscles and relative excess of fibrin, which probably disposes to coagulation. In relation to the effect of pus, it is true that Dr. Lee has produced coagulation of the blood by throwing this substance into the veins; but it is by no means certain that some slight concretions may not have entered with the pus, and have served as nuclei for coagula, or as direct causes by arresting the circulation in the capillaries, or producing foci of inflammation. It is certain that pus has existed largely in the blood without having occasioned this effect. Fresh normal pus, strained before injection, is said not to produce it. (See *B. and F. Med.-chir. Rev.*, July, 1857, p. 21.)

The condition of the inner surface of the heart or blood-vessels has much influence over the formation of coagula. Inequality from atheromatous, cartilaginous, or calcareous formations, ulceration or removal of the inner coat, and roughness from inflammation or other cause, favour the deposition, in part from the slight impediment to the movement of the blood, but probably in chief from the affinity of the projecting points for the fibrin.

It has generally been thought that, in inflammation of the veins and arteries, fibrin is exuded from the inner surface, and induces coagulation of the blood so as to fill the vessel, and thus frequently suspend the circulation. Nor do I think that the experiments of Lee, Virchow, and others have yet satisfactorily refuted this opinion. At all events, these very experiments have shown that fibrin is exuded, in the affection referred to, into the substance of the coats, and finds its way into the caliber of the vessels by the rupture of the inner coat, if not by exudation through it. The inner coat, too, though without blood-vessels, is changed by inflammation, losing its smooth and shining character, and becoming more or less softened and brittle.

Carcinoma is a frequent cause of coagulation of the blood in the veins, either in consequence of the entrance of cancerous germs, or from obstruction.

3. *Effects.*—In treating of this subject, I shall consider it in two points of view; first, in reference to the direct effects of coagula in general; and, secondly, in connection with their transportation to points distant from their place of origin, and the various resulting morbid conditions.

(*a*) *Direct Effects of Coagula.*—With regard to the effects of coagula in the heart, in disturbing, and more or less restraining its movements, and sometimes causing sudden death by interrupting the general circulation, enough has perhaps been already said under the diseases of that organ. I would, however, call attention to opinions, strongly practical in their tendencies, put forth by our countryman, Dr. C. D. Meigs, in a paper published by him in the *Medical Examiner* for February, 1849 (*page* 141), and known to have been entertained by him before that time. According to Dr. Meigs, persons much reduced by hemorrhage are particularly prone to the heart-clot, from the state of their blood. If from any cause, as by sitting up in bed, or any other mode of exertion, faintness or positive syncope is induced, the retarded movement of the blood favours the separation of the fibrin, and a coagulum is likely to be formed in the heart with fatal effect. He ascribes to this cause many of the instances of sudden death which occur in childbed.

There is reason to think that coagula in the blood-vessels sometimes cause inflammation of the vascular coats, acting like foreign bodies upon them. This inflammation is generally not more than may be useful, in producing the changes requisite for the organization and ultimate conversion into ligamentous tissue of the clot itself, and is a natural process of cure. It is true that the blood-vessel is obliterated, but this in general is of little account; as the circulation is maintained by the enlargement of collateral branches. But it is possible that the inflammation may, in unfavourable states of the system, be in excess, or take on a depraved character, ending in suppuration and a further contamination of the blood.

The effects of *coagula in the arteries* vary with the degree in which they produce impediment or obstruction to the circulation. When the artery still remains permeable, they occasion, in greater or less degree, local anæmia in the parts supplied by the affected vessel, marked by paleness, coolness, shrinking of the tissue, and defective performance of function. If the impediment continue, nutrition is affected, atrophy of the part may occur, and ultimately fatty degeneration. If the organ is important, as the brain or heart, these results may be in the highest degree dangerous. But they are not necessarily fatal; for either the clot may be at length dissolved through a change in its own nature, or an altered condition of the blood, or collateral circulation may take place, and supply the deficiency. Nor is complete obstruction of an artery necessarily fatal to the parts supplied by it; for its office may be vicariously supplied by other vessels; but, when the coagulation is extensive, not only affecting a main trunk, but spreading through its ramifications, mortification necessarily occurs from the want of blood, and life is generally, though not always lost; as the dead part may separate by sloughing, or may be removed, and the system survive the want of it.

Another result of arterial coagula, is said to be the formation of circumscribed fibrinous masses in the midst of an organ, the supply of which with blood is impeded, as in the lungs, spleen, and kidneys; and foci of effused blood are said to be produced under similar circumstances. This fact, which

Should the coronary vessels of the *heart* become obstructed, it is presumed that, in complete obstruction, there would be paralysis of the organ and fatal syncope, and in the incomplete, more or less weakness of the circulation, fatty degeneration, and perhaps the symptoms of angina pectoris.

In the *parenchymatous organs*, the prominent effects hitherto traced are the circumscribed fibrinous and sanguineous infarctions already referred to.

The symptoms, short of gangrene, noticed in the *extremities*, have been shooting pains, sensations of pricking and numbness, and feeble or absent pulse.

But, besides the local effects above enumerated, it is supposed that these coagula, scattered in numbers in one or more organs, and undergoing various degradation, may acquire the property of poisoning the whole blood, and thus becoming the source of purulent infection, metastatic abscess, &c.; but much of this must, in the present state of our knowledge, be considered as simply possible, or at most probable, and not yet sufficiently established by observation to be admitted into the category of pathological truths.

It is obvious that, should symptoms considered as characteristic of coagula in the vessels occur, more or less suddenly, an examination should be made of the heart. If murmurs be discovered, justifying the conclusion that there may be excrescences on the valves, or coagula in the cavities, the fact would be in a considerable degree confirmatory of the suspicion that the affection is of the embolic character.

4. *Treatment.*—Little can be done in the treatment of coagula, even when ascertained or presumed to exist, except to palliate the symptoms. The cure, if to be effected at all, must be left mainly to nature. Nevertheless, as an excessively fibrinous state of the blood, positive or relative, is believed to favour the production of coagula, and as fibrin is dissolved in alkaline solutions, there would seem to be an indication to diminish the proportion of fibrin, and to increase the solvent power of the blood, by increasing its alkalinity. The carbonates or bicarbonates of the alkalies, the alkaline salts with vegetable acids, and iodide of potassium freely given, are calculated to meet these ends. Should the systemic actions be feeble, carbonate of ammonia might be used. In anemic cases, the proportionate excess of fibrin should be corrected by the use of chalybeates, which serve to increase the red corpuscles, while the alkaline remedies may be given conjointly if deemed advisable. There might be hope by these means of aiding in the solution of the existing coagula, and preventing the formation of others.

Should inflammation of the veins or arteries be present, it must be counteracted by the measures enumerated under arteritis and phlebitis.

Cachectic states of the system must be counteracted by remedies elsewhere recommended, as the mineral acids, quinia and other vegetable tonics, chlorate of potassa, opiates, nourishing food, and stimulants if necessary.

Finally, care should be taken to favour the operations of nature by rest, position, and such local measures as the peculiar circumstances of each case may seem to require.

Article VII.

SCURVY, OR SCORBUTUS.

SCURVY may be defined to be a disease in which the blood is depraved, and the system debilitated, with a tendency to hemorrhage and petechiæ, and to local congestion, or feeble and imperfect inflammation in various parts of the body, especially in the gums, and without necessary febrile complication. Its essential character is undoubtedly an altered state of the blood, from which all its phenomena flow directly or indirectly.

The complaint has probably existed from the earliest times; and obscure notices of it may be found in the writings of the ancients. The first distinct account of it is contained in the history of the Crusade of Louis IX., in the thirteenth century, against the Saracens of Egypt, during which the French army suffered greatly before Damietta, from this among other diseases. But it was little noticed by medical writers until the sixteenth century, when the revival of letters gave a new impulse to inquiry in every direction. At that time it prevailed endemically in various parts of Europe, especially in the north; and it continued to prevail, with little abatement, until towards the middle of the last century. Though found among the peaceable population of towns and villages, and especially among those engaged in other than agricultural pursuits, it was most destructive in armies and besieged cities, and in the seafaring classes; the hardships and privations incident to the life of the soldier and seaman being the most efficient causes of the disease. The accounts of its ravages given by historians and medical writers, during the period mentioned, are in the highest degree revolting. Many thousands were often cut off, within a few months, in single armies and garrisons; and it is probable that more seamen perished of scurvy alone than from all other causes combined, whether sickness, tempest, or battle. The narrative of almost every long voyage made in the sixteenth, seventeenth, and earlier part of the eighteenth centuries, is a record of its terrible fatality. Whole crews were prostrated, fleets crippled, and great expeditions frustrated by this single scourge. The memorable voyage of Lord Anson, in which more than eighty out of each hundred of the original crews perished of scurvy, is familiar to every reader. The extension and improvements of agriculture, the ameliorated condition of the lower classes, the altered modes of warfare, and a more generally diffused knowledge of the causes of the disease and the modes of preventing it have gradually diminished its prevalence in Europe, where it is now comparatively rare; and, since the time of Captain Cook, who led the way in the adoption of effectual means of prevention at sea, it has ceased to be the terror of seamen, and occurs only where the requisite precautions have been carelessly neglected, or rendered nugatory by unavoidable accident. In this country it is very little known, and there are many practitioners, even in our cities, who have never seen a decided case of it. But, as its prevalence depends on causes which may be brought into operation at any time, and in any place, it becomes important that the profession should be thoroughly conversant with all that relates to it, so that it may be at once combated when met with, and means of prevention suggested wherever they may seem to be required. This remark is especially applicable to the regulation of the diet in prisons, hospitals, asylums, garrisons, ships, &c., which frequently comes under the direction of the medical man, and should always have reference to the possible occurrence of the disease in such situations. Even the regimen of the sick, in ordinary private practice, should be regulated by the physician with some regard to scurvy, which, within the experience of the author, has appeared to result from a restricted diet, too long continued, under medical direction.

Symptoms, Course, &c.—Scurvy is generally very gradual in its approach, so that it is scarcely possible to say, in any particular case, what was its precise time of attack. Attention is commonly first attracted by an unhealthy paleness of complexion; a feeling, on the part of the patient, of languor and despondency, with an indisposition to bodily action, and unusual fatigue after exercise; a sensation of weariness and aching in the limbs as from over-exertion, though the patient may have been at rest; and some swelling, redness, and tenderness of the gums, with a tendency to bleed from slight causes.*

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* Dr. Foltz, of the U. S. Navy, in a report on the scurvy which appeared in the squadron blockading the ports in the Gulf of Mexico, states that "lassitude and indisposition

With the advance of the disease, the face becomes paler, and assumes a somewhat sallow or dusky hue, and often a degree of puffiness; the lips and tongue become pallid, and contrast strikingly with the gums, which are purple or livid, especially at their edges, rise up between and around the teeth, are soft and spongy, and bleed from the slightest touch; the breath is offensive; purplish spots or blotches appear upon various parts of the surface, beginning usually upon the lower extremities, and afterwards extending to the trunk, arms, and neck, though seldom affecting the face; hemorrhage frequently occurs, most commonly from the nose, gums, and mouth, but sometimes also from the stomach, bowels, and urinary passages; the feet become edematous, and the legs swollen and painful; the general debility increases; and muscular exertion is apt to be attended with palpitation of the heart, panting, vertigo, dizziness, and a feeling of faintness. The petechial spots are obviously owing to the extravasation of blood within the cutaneous tissue. They are usually small and irregular, but sometimes as large as the palm of the hand, or even larger. Occasionally portions of surface look as if bruised, without having suffered any violence; and blows, which, under ordinary circumstances, would produce no effect, now give rise to extensive ecchymoses. Should the disease still continue, all the symptoms become aggravated. The complexion assumes often, with its paleness, a livid or leaden hue; the gums swell greatly, and put forth a blackish, fungous growth, so as sometimes to conceal the teeth; blood continually oozes from them; sloughing occasionally takes place, laying bare the necks of the teeth, and extending, in very bad cases, even to the cheek; the teeth become loose and sometimes fall out; the patient is unable to chew solid food in consequence of the state of his gums; the breath becomes intolerably offensive; hard and painful tumefactions occur in the calves of the legs, among the muscles of the thigh, upon the tibiæ and lower jaw, and in the hand, with stiffness and contractions of the joints, especially of the knees, and severe pain in the extremities upon every attempt at movement; and the debility, before so prominent a feature in the case, now becomes excessive, so that the least exertion is dangerous, and the patient sometimes dies suddenly upon rising from bed, or upon being conveyed, without great caution, from one situation to another. Various other unpleasant phenomena are often presented. Wounds, and even slight scratches, degenerate into unhealthy ulcers, old cicatrices break out afresh, and existing ulcers assume a new and much worse aspect. A sanious liquid flows from their surface, or blood oozes out and coagulates, forming an adhering crust, or a soft, thick, gory mass, which sometimes increases rapidly and attains an incredible size. The ulcerated surface itself is soft, with large flabby granulations about the edges. The bones are said to be softened, united fractures are again opened, and, in the young, the epiphyses sometimes separate from the bones. Eruptions upon the skin assume a purplish or livid colour; and the seats of existing or previous injury of almost every kind become points for new morbid action. Thus, when the gums are affected by mercury, they usually suffer more speedily, and in a greater degree, than under ordinary circumstances. Along with the prostration of the vital powers, there is often displayed a strong tendency to local congestions of a low inflammatory character, attended with the effusion of blood or fibrin, which not unfrequently coagulates, and, when in vital organs, becomes a source of great danger. Hence the hard and painful tumours of the extremities already spoken of. These congestions and effusions may take place in the substance of the lungs, simulating pneumonia; in the cavities of the pleura and pericar-

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to muscular exertion were not among the symptoms which ushered in the disease," and that "there were great activity and not unfrequently cheerfulness, good appetite, and sound sleep at night, after the teeth were loosened, the gums ulcerated, the limbs edematous and discoloured." When at last the patient gave way, "it was not an indisposition to corporeal exertion, but an actual disability." (*Am. Journ. of Med. Sci.*, N. S., xv. 47.)

e and digestion remain unimpaired almost to the last, unless the dis-
s sometimes happens, should be complicated with fever. Indeed, there
ı a craving for food, especially for fresh fruits and vegetables; and one
most painful circumstances in the complaint is sometimes the inability
lge this craving, either from the want of wholesome food, or from the
bility of chewing the hard materials supplied, in consequence of the
f the gums and teeth. Occasionally, however, there is vomiting, with
ric distress, and other evidences of stomachic disorder. The bowels
most cases, costive, and in some obstinately so; but diarrhœa also not
ently intervenes, with black or bloody and offensive evacuations. The
generally small, feeble, and slow; and the skin below the healthy tem-
e; but cases occur in which the pulse becomes very frequent, and the
febrile, probably from the sympathy of the system with various local
re congestions. The skin is usually dry, and is said not unfrequently
me the appearance of goose-flesh, though smooth and shining upon the
ties when swollen. The urine is scanty and high coloured. Great ema-
usually attends the disease when severe or lasting, but not invariably.
erebral disturbance is ordinarily observable; and the patient often re-
ll possession of his senses and intellect to the close. He is even scarcely
of his weakness; feeling, while at rest, as if competent to exertion,
ning his error only upon trial. Sometimes, however, delirium occurs
dvanced stages. Nyctalopia has been occasionally observed at the com-
ent of the disease.† The patient is often unable to sleep at night;
s is said to be among the most painful symptoms.

vy is very variable in its course. Generally, as already stated, it is
l in its approaches. Sometimes, after remaining latent for a consider-
ne in the system, it breaks out fiercely, and runs a very rapid course to
ination. In other cases, it remains for a great length of time without
ation, and ceases under a change of circumstances. Much depends up-
constitution and previous strength of the patient. Persons debilitated
ase, age, or intemperance, yield most readily to its onset, and sink soonest
t. At sea, it is usually much more violent than upon land, in consequence
greater intensity of its causes. Conversely, however, land scurvy is in
l more obstinate under treatment, probably because the constitutional
sy must be stronger, to have led to the disease under circumstances so

much less unfavourable. Land scurvy, as usually seen at present, is a comparatively mild affection; seldom exhibiting severer symptoms than an altered complexion, red, swollen, tender, and bleeding gums, offensive breath, occasionally epistaxis, petechiæ on the extremities, edematous feet, a weak pulse, and more or less muscular debility. There does not, however, appear to be any real ground for the distinction which has sometimes been made into sea and land scurvy. The affections are identical, and, when the causes upon land are as powerful as at sea, as sometimes happens in besieged cities, the ravages of the complaint are not less fearful.

Scurvy is occasionally complicated with other diseases, which greatly aggravate the danger. Of these, the most fatal are probably typhus fever and dysentery, which are the more common attendants, as they are produced by causes which, if not identical, are very frequently coincident with those of the complaint under examination.

The disease generally occurs towards the close of winter or early in spring. It is more prevalent in cold than in warm countries, and among the poor than among those in comfortable circumstances. Officers frequently escape, while the disease is rife among the common soldiers and seamen. It is more frequent and fatal in the old than in the young, though no age is exempt.

Anatomical Characters.—The most characteristic phenomenon revealed by dissection is the presence of extravasated blood, in greater or less amount, in various parts of the body. The purple spots upon the skin are nothing more than so many ecchymoses in its substance, or in the subcutaneous areolar tissue. Similar purple or blackish stains are observed in the mucous and peritoneal coats of the bowels, and the mucous coat is often stained with effused blood. Clots of extravasated blood or coloured fibrin are found in the areolar tissue, the substance of the muscles, between the periosteum and bones, and occasionally in the serous cavities. Dr. Budd states that, in the cases in which the bones were thus separated from the periosteum, he observed no signs of caries or exfoliation. Not uncommonly, dark liquid blood distends the cavities of the pleura, pericardium, and peritoneum, and those of the synovial membranes, but seldom the arachnoid. Dr. Karawagen, out of sixty patients who died of scurvy at Kronstadt, found bloody effusion in the pericardium in thirty cases, in the pleura in twenty-two, in the peritoneum in two, and within the cranium only in one. The liquid in the pericardium amounted to four or five pints, in the pleura to ten or twelve pints, and in the peritoneum to from thirty to thirty-five pints. (See *Med. Examiner*, iv. 525.) These, however, were uncommon cases; and the disease, which occurred among the seamen of Kronstadt as a kind of epidemic in the spring and summer of 1839, was peculiarly characterized by this tendency to bloody effusion in the cavities. Serous effusion, transparent or turbid with blood, is also found in the areolar tissue, the serous cavities, and the parenchyma of organs, especially of the lungs. Though generally free from bloody extravasation, the ventricles of the brain frequently contain considerable quantities of serum. Coagula of blood or of fibrin are found in the cavities of the heart, and thin, liquid blood in the great veins. Andral observed, in one case, the aorta filled with liquid black blood. (*Clin. Méd.*, i. 585.) The spleen is often enlarged, distended with blood, and very soft. When not coloured by effused blood, the muscles and mucous membranes are pale. The texture of the heart and muscles generally is often flabby. The bones have sometimes been found unusually fragile, infiltrated with blood, separated from their cartilages and epiphyses, and disjoined in the position of old and united fractures. Various results of recent or old inflammatory processes in different parts of the body have also been noticed; but these were probably, in most cases, mere complications, and not essential parts of the disease.

Causes.—Different opinions have been held as to the causes of scurvy, and the medical world is scarcely yet united. Some have thought that it arises from the use of salted provisions, and that an excess of salt is the source of the mischief. This opinion was advocated by Cullen, and seemed to be in some measure justified by the fact, that the disease had been most severe among the crews of ships, who were confined for a long time exclusively to salt meat and bread or biscuit. But subsequent experience has proved that it may occur among persons plentifully supplied with fresh meat, and with that exclusively; while patients will recover from the disease though using salt meat freely, if also furnished with fresh vegetables.

Some writers have ascribed the disease to the use of spoiled meat, worm-eaten bread, and putrid water, which, as they supposed, could not but supply a putrid blood. Crews furnished exclusively with this kind of aliment have undoubtedly suffered terribly with scurvy; but in all such cases there was a want of vegetables; and the use of putrid meats, under other circumstances, does not necessarily induce the disease.

Others have found a solution of the problem in the influence of impure air, especially when aided by cold and dampness. In explaining the prevalence of the disease at sea, they look less to the provisions than to the confinement of the seamen in close, crowded, and filthy holds. Hence, too, the frequency of the disease in prisons, camps, and besieged towns, where great numbers are crowded together. But they do not appear to have adverted to the fact that, notwithstanding the utmost care in ventilating ships, and preserving cleanliness and purity of air, the disease has arisen and raged unchecked, so long as the proper food was wanting. Besides, these causes are at present constantly operating in various over-crowded cities; and we are as constantly witnessing their influence in the production of typhoid diseases; but we scarcely ever see scurvy result from them. The greater prevalence of the disease in cold countries has been ascribed to the influence of temperature; but even in the coldest regions there is an entire exemption from it, when fresh vegetables are sufficiently supplied; and the fair inference is, that climate acts chiefly as it favours, or otherwise, an access to this kind of food.

Meat, whether fresh or salt, cannot be the cause of the disease; for it is sometimes produced when little or no meat is furnished, as among the people of India, when confined in hospitals or prisons, and fed upon rice and other farinaceous products. The author has witnessed a case of the disease in a young lady, who was confined for a long time, for the cure of an obstinate diarrhœa, to a diet exclusively of barley.

Dr. Budd, the author of an elaborate treatise on scurvy, contained in *Tweedie's System of Practical Medicine*, has diligently compared a great number of accounts of the disease drawn from various sources, and appears, to have pretty nearly established the conclusion, that the one essential cause is the want of fresh succulent fruits and vegetables, or their juices, which he supposes to furnish some principle necessary to the due constitution of the blood, and not to be found elsewhere, or, at least, nowhere in the same perfection. In all the instances adduced of the prevalence of scurvy, there was a deficiency of this kind of food, and in none did the disease occur when it was sufficiently supplied. No matter what the diet, so that this was wanting, scurvy would make its appearance; while with it, neither salted nor spoiled provisions, nor confined and impure air, nor cold, moisture, and fatigue, nor all these agents together, were competent to produce it. Hence the prevalence of the disease in the latter part of winter, and the beginning of spring, when fresh vegetable food has been exhausted, and the new growth has not yet sprung up; and its sudden cessation with the return of vegetation. Hence its comparative frequency in voyages commenced in early spring, when the blood has been depraved by a long confinement to a winter diet, and the ship has sailed either scantily supplied with fresh vegetables, or entirely without them. Hence, too, the general subsidence of the disease with the advance of agriculture, its comparative absence among an agricultural population, and the exemption now enjoyed by the poor, who have, in general, easy access to fresh vegetables, and live largely upon potatoes, considered among the very best antiscorbutics. The almost total expulsion of scurvy from public ships of war, since care has been taken to furnish them with the proper sort of food, is another proof of the same kind. The recent prevalence of the disease in some parts of Great Britain and Ireland, where it had been previously unknown, is very probably owing to the omission of potatoes as an article of diet, consequent upon the blight which has so extensively affected that important crop; and, indeed, the malady has, in many instances, been traced directly to this origin. But there is still some difficulty in admitting, without reservation, the opinion of the necessity of fresh vegetables, and their exclusive possession of the antiscorbutic power. How, upon this ground, can we explain the exemption of the Esquimaux, who, during their long winters, live on the food they draw from the ocean; and of our western hunters, who feed almost exclusively upon game during the same season? In the report of Dr. Gale, of the U. S. Army, dated Council Bluffs, October, 1820, it is stated that scurvy broke out in the regiment stationed at that point, near the close of January, and raged with great severity until the 7th of April, when wild vegetables appeared, and an immediate check was put to it. The soldiers were confined to a diet of "salted or smoke-dried meats, without vegetables or groceries," in an extremely inclement season, and when their strength had been exhausted by unusual exertion. It is not surprising that the disease was fatal among them; but the point of particular interest at present is, that the hunters who resided in the woods, and subsisted on game, and a detachment of troops who were sustained in the same way, were entirely exempt. (*Am. Journ. of Med. Sci.*, N. S., iii. 79.) It appears, from this statement, that fresh wild meat is a preservative against scurvy; unless, indeed, the hunters and soldiers who escaped may have employed some antiscorbutic derived from the forest-trees.

Though it appears to be pretty well proved that the want of fresh vegetable food is the most frequent cause of scurvy, it must be admitted that other causes often co-operate with this, and produce a predisposition which favours the attack of the disease. Whatever debilitates the system, or tends to deprave the blood, will probably have this effect. Among these accessory or predisposing causes may be enumerated previous disease, famine, unwholesome diet, as of putrid meat and worm-eaten, musty, or otherwise injured biscuit and bread, bad water, foul air, sedentary and indolent habits and want of personal cleanliness, the depressing passions, exhaustion from fatigue, exposure to cold, intemperance, and the debility of old age. It has often been observed, on occasions when scurvy raged among multitudes of people, that persons in sound health, with a cheerful and confident spirit, and active habits of mind and body, escaped entirely, or were but slightly affected, though partaking of the same fare with those who were dying around them.

Nature.—All the phenomena of scurvy, as well as the character of its cause, point to the blood as the original seat of the disorder. Some have supposed that the first link of the chain of diseased action is in the function of digestion, which fails to effect a due elaboration of chyle out of the materials presented, and thus produces a vitiated blood. But the fact is, that the organs of digestion are remarkably exempt from derangement, throughout almost the whole course of the complaint. The appetite is unimpaired, and the food readily digested; and as soon as suitable materials out of which good blood can be prepared are offered, there is no deficiency in the powers of assimilation. It is, indeed, wonderful how rapidly the system recovers from the lowest depths of prostration, when the opportunity is presented, proving that the fault is not in its actions but in its supplies. But, though it is easy to decide that the blood is disordered, it is not so easy to say in what manner. Writers on scurvy have generally stated that the blood is dissolved; that when taken from the body it refuses to coagulate, or coagulates partially, forming a black, semi-fluid, jelly-like mass, from which the serum separates but imperfectly, if at all. When the serum does separate, it has been described as reddish from the corpuscles held in solution, and has even been said to have an acrid taste. (Roupe, *De Morb. Navig.*, p. 147.) After death, too, the blood is asserted to be found as a dark fluid in the larger vessels. There is, no doubt, some truth in these statements. But it is certain that this is not always the condition of the blood. It has been noticed, for example, that, where scurvy is complicated with inflammation, not only does the blood coagulate, but the clot exhibits the buffy and cupped surface. In the blood of three patients affected with well-marked scurvy, Dr. Budd states that the separation into serum and clot was as perfect and as rapid as in that of healthy persons. In two of these, the coagulum was small, firm, buffy, and cupped. Though liquid blood exists in the large vessels after death, coagula of blood or fibrin are often found in the heart. Dr. Budd considers the blood as resembling that of chlorosis in the diminution of red corpuscles; and that there is a deficiency of this constituent is evinced by the paleness of the surface during life, and of the mucous membranes, when not stained by extravasated blood, after death. Andral found in the blood of a scorbutic patient whom he examined a great deficiency of fibrin, and is disposed to consider this as characteristic of the disease. (*Patholog. Hæmatol.*, Am. ed., p. 96.) He is thus enabled to account for the frequent hemorrhages that attend it. Mr. Busk, however, found a great excess of fibrin in the blood of three scorbutic patients, with as marked a diminution of the colouring matter. (*Tweedie's Syst. of Pract. Med.*, article *Scurvy.*) It is obvious, therefore, that neither an excess nor deficiency of fibrin characterizes the blood of scurvy. A deficiency of the red corpuscles, though it probably in general attends the complaint, is not its distinguishing character; for the same deficiency exists in chlorosis, which is an essentially different disease. From the observations of the same experimenters, it may be inferred that the proportion of albumen is not materially different from that of health. The distinguishing peculiarity of scurvy, therefore, does not consist in the want of a due proportion of either of the three prominent constituents of the blood. This proportion may be deranged, but there is something else; there is something wanting which is afforded by a diet of fresh and especially succulent fruits and vegetables. What this is has not been certainly determined, and it is useless to conjecture. The question must be left for solution to the skill of the analytic chemist. It should be mentioned, however, that Dr. Garrod, of London, ascribes the disease of the blood to the want of a due proportion of potassa or its salts, basing his opinion upon the result of experimental investigations made by himself.*

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* Since the first publication of this work, numerous experiments have been made with a view of determining the condition of the blood in scurvy. It has frequently been found to coagulate, and even to present the cupped surface. In relation to its organic constituents, the results have been confirmatory of the statements made in the text. From a comparison of those most to be relied on, it appears that, upon an average, the proportion of albumen is about as in health, that of fibrin slightly increased, and that of the red corpuscles greatly diminished. The saline constituents are in about the normal quantity. The microscopic characters of the red corpuscles, and their chemical constitution so far as discovered, do not appear to be altered. MM. Chatin and Bouvier noticed that the albumen, in a case which they examined, required a temperature for coagulation of 165°

Diagnosis.—The only disease with which scurvy is liable to be confounded is purpura, which resembles it in various points. The diagnostic characters of the two affections will be pointed out under the head of purpura.

Treatment.—No disease of equal severity yields more rapidly to proper treatment than scurvy, and in none is the treatment more simple. Remove the patient from the influence of the causes which produced the complaint, and give him suitable food, and it is wonderful how quickly recovery begins, and how rapidly it proceeds. A ship's crew affected with scurvy, daily losing one or more of their number, with scarcely enough upon their feet to navigate the vessel, and no other prospect before them than a miserable death, unexpectedly come across a green island, and cast their anchor in one of its quiet bays. The deepest despondency gives way to cheering anticipations, and exertions are made which would before have seemed beyond their power. The helpless are landed, shelter is obtained, and all are plentifully supplied with fruits and vegetables. An almost instantaneous improvement takes place. The complexion begins to assume the hue of health, the gums become firm, hemorrhage ceases, the petechiæ fade away, muscular strength returns, ulcers, if existing, take on a healthy aspect, and, in the course of a few days, the patient, whom the next day, or even the next hour might have seen perish without relief, is so far recovered as to be able again to assume the discharge of his active duties.

The important point in the treatment of scurvy is, therefore, the supply of suitable food; and it is highly desirable to understand what substances have the antiscorbutic virtue, and the relative degree in which they possess it. It has already been stated that fresh fruits and vegetables are highly antiscorbutic. Probably the most effectual among these are lemons, limes, oranges, and other fruits belonging to the family of Aurantiaceæ, most if not all of which contain citric acid. Lemon-juice is in itself an excellent remedy for scurvy, and if to be obtained should be freely administered to the patient in the form of lemonade. Most acidulous fruits have similar virtues; and it has been observed that they are usually most effectual when eaten before they have become perfectly ripe. Fresh succulent vegetables perhaps come next

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F., at least 5° higher than is requisite in health, and that the plasticity or cohesion of the fibrin was greatly diminished. For a particular account of the results of the several analyses, the reader is referred to the *British and Foreign Medico-chirurgical Review* for October, 1848.

Reference has been made in the text to some experiments by Dr. Garrod, of London, which direct attention to *potassa* as the ingredient of the blood, a deficiency of which may be the characteristic condition of scurvy. Dr. Garrod found 1. that articles of food, the exclusive use of which was known to produce scurvy, contained less of the salts of potassa than those which are capable of supporting the system in the healthy state; 2. that those substances which act as antiscorbutics, such as fresh fruits and vegetables, and especially potatoes, contain a large proportion of these salts; 3. that the blood of a scorbutic patient examined by him contained a much smaller proportion of potassa than healthy blood, and that less was excreted with the urine; and 4. that the disease may be cured by the addition of small quantities of some one of the salts of potassa to the food. Dr. Garrod also makes the suggestion, that the muscular debility of scurvy may be explained upon the supposition, that the muscles are deficient in potassa, which is contained in them largely in health, and, according to Liebig, is essential to their action. But it appears to me that much further investigation will be necessary before the truth of this hypothesis can be considered as established. Opposed to it at present are the facts, that nitre, which is a salt of potassa, though said to be occasionally useful in scurvy, has often failed to cure it; that, on the contrary, the disease has been cured simply by the addition of pure citric acid, which contains no potassa, to the diet of the patient: and that nitre is frequently used in the preparation of salted beef, which is one of the prominent substances used as food by scorbutic crews. When in London, in the summer of 1848, I was informed of a case of scurvy, which, after failure under a course of treatment with the salts of potassa, immediately began to recover when the patient was allowed to eat fresh vegetables. (*Note to the second edition.*)

in order, and they are generally better raw, as in the form of salad, than cooked. Those belonging to the natural order of Cruciferæ have long had an antiscorbutic reputation. Such are cabbage, turnips, radishes, horse-radish, scurvy-grass, mustard, water-cresses, capers, &c. Cabbage, in the form of sour-krout, in which it has undergone a slight fermentation and become sour, is highly esteemed, and considered as among the best remedies in scurvy. The different sorrels, lettuce, spinage, celery, parsley, endive, garlic, onions, carrots, and potatoes are all classed among the antiscorbutic vegetables. Potatoes in the raw state have long enjoyed some credit; and from the statements of Dr. Bally, of England, it appears that they are highly antiscorbutic when boiled. From an examination of the dietaries of different prisons and pauper asylums, he found that, when potatoes were excluded, or allowed only in small quantities, scurvy was apt to occur, while in those well supplied with them it was wanting; and he succeeded in banishing the disease from the Milbank Penitentiary by their use. From three to six pounds, he thinks, should be allowed weekly to each inmate of similar institutions. (*Braithwaite's Retrospect*, Am. ed., no. 7, p. 197.) Perhaps one of the reasons why scurvy is less prevalent among the poor than formerly is the general use of the potato; and it has been already stated, that the recent prevalence of the disease in some parts of the British Islands has been ascribed to the want of it. Milk is thought to be antiscorbutic. Perhaps, to a certain extent, it is so; but cases of the disease have occurred among persons plentifully supplied with milk, but destitute of fresh vegetables. The pines, spruces, and firs probably have antiscorbutic properties. Their tops, in the form of decoction, have often been used as a remedy or preventive with asserted advantage. This knowledge may be of use to hunters, and others who spend long winters in the pursuit of furs, and subsist chiefly on game. Various fermented liquors have enjoyed some reputation. Among them may be mentioned spruce beer, cider, malt liquors, and wines, particularly the lighter and acidulous kinds. Infusion of malt was highly esteemed by Captain Cook. Pure farinaceous substances have little antiscorbutic virtue; the disease often breaking out among persons plentifully supplied with this kind of food. But the *sowens* of the Scotch, a mixture of oat-meal and water, which has undergone a slight acetous fermentation, is said to be of great efficacy. It was a natural inference from the general usefulness of sour vegetables, that vinegar might be found antiscorbutic; but it has repeatedly failed on trial, and the same may be said of the mineral acids. Nevertheless, pickled fruits and vegetables are not without virtue. Dr. G. Perin, of the U. S. Army, found the juice of *Agave Americana*, the *maguey* of the Mexicans, in the dose of two or three fluidounces three times a day, an excellent remedy in scurvy, more efficacious even than lime-juice. (*N. Y. Journ. of Med.*, N. S., vii. 182.) In the Arctic expedition, under the command of the late Dr. Kane, no remedy was found so efficient, in preventing and curing scurvy, as a diet of raw seal's flesh.

From what has been said, it may be inferred that a patient with scurvy should drink freely of lemonade, and, along with a due proportion of easily digested fresh animal food, and farinaceous substances, should also partake of potatoes, raw cabbage or sour-krout, or such other vegetables included in the above list as he may prefer, or as may be attainable. In the absence of fresh lemon or lime-juice, citric acid may be employed, though probably less efficacious. While the gums are sore and the teeth loose, milk, and soups containing vegetables, may be substituted for harder food. If there be considerable debility, cider, the malt liquors, or wine should be allowed. In cases of very great debility, the patient should not be incautiously removed from his bed or hammock; and, when removal is necessary, he should, as recommended by Dr. Lind, take previously a drink of wine with lemon-juice. It scarcely need be stated that the influence of all the accessory causes of the disease should be obviated as far as possible.

Little is required in the way of medicinal treatment. Constipation may be corrected by mild laxatives, such as rhubarb and castor oil. If the appetite is feeble, it may be stimulated in some instances by the bitters and mineral acids. The astringents may sometimes be found useful in checking hemorrhage. Opium should be given to procure sleep in obstinate wakefulness. Nitre, or a solution of this salt in vinegar, has been recommended as having strong antiscorbutic virtues. Dr. Garrod recommends the salts of potassa, on the ground that these are deficient in the blood of the scorbutic; and the carbonate and bitartrate of that base were employed with success, in several cases, in New Mexico, by Dr. W. A. Hammond, assistant surgeon of the U. S. Army; no fresh vegetables being given, because none could be obtained. (*Am. Journ. of Med. Sci.*, N. S., xxv. 103.)* Tincture of cantharides, which has also been recommended, needs further trial before it can be received into the list of remedies. All writers admit that the use of mercury is very pernicious. Bleeding and blisters are also generally condemned, the former from the fear of debility, the latter from the danger of gangrene. It is possible that, in some cases complicated with inflammation, blood might be advantageously abstracted either generally or locally; but it must be done, if at all, with the greatest caution. In cases of abundant effusion of blood into the pericardial and pleural cavities, paracentesis was resorted to in several cases by Dr. Karawagen, in all with relief, and in one case of pericardial effusion, in which three pints and a half of fluid were withdrawn, with the effect of saving the life of the patient.

As local remedies, solution of chloride of lime, very dilute muriatic acid, or metallic astringent solutions, as those of sulphate of zinc, sulphate of copper, nitrate of silver, or acetate of lead, may be applied to the gums; and a solution of creasote or of permanganate of potassa may be used to correct the fetor of the gangrenous ulcers. For ulcers upon the surface, the best application is said to be dressings of lint, soaked in a mixture of one part of lemon-juice and two or three parts of water, with a covering of oiled silk to prevent evaporation. When the limbs are swollen and painful, some relief may be obtained from anodyne and emollient cataplasms or fomentations.

Prevention.—Prophylactic measures in relation to scurvy are of the utmost importance in sea-voyages. It is owing to the general employment of these, that this scourge of seamen has within the last half century been deprived of almost all its terrors. Nor are these measures difficult of execution. It is only requisite to attend to the cleanliness and ventilation of the ship, the general comfort of the crew, and the supply of suitable provision. The last is by far the most important, so far as scurvy merely is concerned. It is obvious that whatever provision is employed should be entirely sound; and care should also be taken to keep the water sweet. But something more is necessary. The ship should be supplied with a sufficiency of those substances which have been shown to possess antiscorbutic virtues. Lemon or lime-juice is perhaps the most efficient of these. In the British navy, a fluidounce of lemon-juice, with a sufficient quantity of sugar, is furnished daily to each one of the crew, after the ship has been two weeks at sea. The difficulty is in the preservation of the juice. For this purpose, it has been recommended to boil it down to the consistence of syrup. But in this state it is said to have lost some of its antiscorbutic power. The same remark would apply to the solid citric acid. The juice will keep well if made into a syrup with two pounds of sugar to the pint. The addition of spirit will answer the same purpose. Dr. Budd states that the juice used in the British navy is preserved unimpaired by the addition of one-tenth of strong brandy. But it appears, from published statements, that lemon-juice has not always afforded protection; whether from the bad quality of the juice employed, or from some other cause, it might be difficult to decide. Other antiscorbutic substances, therefore, should not be neglected. Of the vegetables, the potato, and cabbage in the form of sour-krout, unite, perhaps, more than any others, efficiency with capability of preservation. A supply of these, or of some equivalent substances, should always be added to the salt meat, and biscuit, bread, or other farinaceous product, which constitute the main diet of the seamen. Pickles, though probably possessed of some virtues, cannot be relied on. In long voyages, the ship may generally avoid danger by taking, at the start, as many fresh vegetables as can be kept, and using the same precaution at each stopping-place. The appearance of scurvy in the crew ought to induce the search of fresh vegetable provision at the nearest port, should higher duties permit this deviation from the plan of the voyage. Fresh meat, when attainable, should be added to the ship's provision, not so much for the sake of any antiscorbutic property, as from the circumstance that the occasional use of it will tend to sustain a healthy digestion, and thus obviate one of the predisposing causes. For this purpose, in very long voyages, some of the various forms of preserved animal food may be resorted to, which modern art has learned to prepare in such perfection. It may not be amiss, also, especially in extreme northern or southern latitudes, to be well supplied with the seeds of mustard and garden cresses, which may be made to germinate in pots, and thus afford an antiscorbutic salad. The remarks made in relation to ships are not less applicable to the provisioning of cities or garrisons against long sieges. An equal attention should be paid, in regulating the dietaries of prisons, asylums, hospitals, and other institutions in which numbers are crowded together under some general oversight, to furnish the inmates plentifully with fresh succulent vegetables, and, among others, with potatoes, a neglect of which precaution is inexcusable, when the requisite supply is in general so readily obtained. During the late war in this country, onions were in great demand, in our camps and garrisons, as a preventive of scurvy.

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* In a recent visit to London, the author was assured by Dr. Garrod that, so far as he has been able to observe, scurvy is cured by the *citrate of potassa*. Mr. Cornel, Surgeon of the Dreadnought Hospital Ship, has found *chlorate of potassa* with lemon-juice more efficient in the cure of the gums in scurvy than any other remedy, and decidedly more so than lemon-juice alone. (*Med. T. & Gaz.*, Nov. 1857, p. 475.)—*Note to the sixth edition.*

Article VIII.

PURPURA.

Syn.—*Hemorrhœa petechialis.*

THIS disease is characterized by dark-red or purplish spots, called *petechiæ*, caused by the extravasation of blood beneath the cuticle, with a frequent tendency to hemorrhage, and without any other essential obvious derangement of the system. Petechiæ frequently appear as one of the symptoms of various diseases, as scurvy, typhus fever, malignant exanthemata, and other adynamic affections, in which the blood has more or less of that condition in which it is said to be dissolved. The particular state of the blood, or of the capillaries, which induces this appearance, is probably analogous, in some measure, to that which occurs in purpura; but the affection does not receive this name, unless original, and without complication with other well-marked and recognized diseases.

Purpura is usually ranked among the cutaneous eruptions, but, as seems to me, upon insufficient grounds. The appearance upon the skin has nothing in common with a proper eruption. In the latter, there is always some deranged sensation, or some evidence of vascular irritation, or of inflammation. But nothing of this kind is observable in true purpura. The petechiæ are the result merely of effused blood; and are not, in fact, confined to the surface, but exist often in other parts of the body. The disease is much more closely allied to the hemorrhages; but as there is good reason for considering it as essentially connected with a disordered state of the blood, it is here ranked among the diseases of that fluid.

The disease has been divided, by the writers who follow Willan and Bateman, into several varieties, which, however, for the most part, appear to differ rather in degree than in essential character. The *Purpura simplex* and *Purpura hæmorrhagica*, of these authors, are mere grades of the same affection. The occurrence of hemorrhage is an incident to which simple purpura is always liable; and no case, therefore, can be certainly said to belong to this variety until its close.

Symptoms.—The appearance of the petechiæ is sometimes preceded by various symptoms indicative of deranged health; such as languor, general uneasiness, indisposition to active exercise, muscular weakness, paleness or sallowness of the complexion, irregular pains in the back, limbs, and abdomen, slight headache, diminished appetite, and sometimes great general debility and faintness. They are also said to be occasionally ushered in by a dry and frequent cough. Some cases are attended with some of these symptoms, others with others; and, as a general rule, their grade of severity, especially as regards the debility and pains in the back and limbs, may be looked upon as a measure of the violence of the subsequent affection. In many instances, the preliminary symptoms are wholly wanting; and the appearance of the petechiæ marks the commencement of the disease.

The spots generally appear first upon the lower extremities, especially below the knee, and afterwards extend to the arms and trunk, and occasionally, though comparatively seldom, to the hands and face. Sometimes, in mild cases, they are confined almost exclusively to the legs. It is said that they occur usually at night, and are first observed in the morning. The latter statement is undoubtedly correct; as it is in the morning generally that the legs are seen bare, and an opportunity for discovering the affection is afforded. The former is probably an inference, and by no means a necessary one. The size of the petechiæ varies exceedingly, from the minutest speck to several inches in diameter; but they are mostly about the size of a flea-bite, to which they bear some resemblance, though without the darker central spot, that marks the point at which the beak of the insect was inserted. They are generally somewhat circular; but, in severe cases, are often mingled with long streaks and irregular patches of the same colour, as if produced by the stroke of a whip, or by a bruise. Their colour is at first bright-red in vigorous subjects, but purplish-red in the feeble and old. It afterwards assumes successively a purple, violaceous, and brownish or yellowish-brown hue, and at last gradually fades away, disappearing entirely in the course of six or seven days. In the mean time, however, fresh crops have successively appeared. and spots of different colours are thus intermingled, giving the skin a mottled aspect. In some instances, the succeeding crop does not make its appearance until the first has quite faded. The author has had under his care a case in which this recurrence was at regular weekly intervals. No sensation whatever attends the occurrence of the petechiæ, and, in ordinary cases, there is no elevation of the cuticle. The patient first becomes aware of their existence by seeing them. In hemorrhagic purpura, small bloody blisters occasionally mingle with the stains of the skin. No degree of pressure alters the colour of the spots, proving that they are produced by extravasated blood, and are not true eruptions.

Some cases are wholly without exterior hemorrhage; in others, this is the most prominent symptom. The former are usually mild, the latter often very severe. In the hemorrhagic variety, there may frequently be seen upon the tongue, and other parts of the mucous membrane of the mouth, small bloody blisters, which, from the delicacy of the epithelium, easily break, and occasion an oozing of blood from this surface. Hemorrhage of various degrees of violence takes place from different mucous membranes, and sometimes from all. Blood escapes from the nostrils, gums, and other parts of the mouth, conjunctiva, external auditory meatus, stomach, bowels, kidneys and urinary passages, rectum, and vagina; sometimes largely, so as to occasion immediate alarm, but generally in small quantities. It usually ceases spontaneously, to return at irregular intervals; but it is sometimes continuous, and sustained by a constant leakage, as it were, from the membranes. Occasionally the hemorrhage takes place into one of the vital organs, as within the cranium or into the parenchyma of the lungs, producing cerebral and pulmonary apoplexy, and very greatly endangering life. The blood is said to coagulate imperfectly, forming a soft semifluid or jelly-like mass. Sometimes, however, it is asserted to have coagulated firmly, and the clot to have presented the buffy and cupped surface. In the latter cases, the complaint was probably complicated with inflammation.

The pulse, in mild cases, is rarely much affected; being, perhaps, in general somewhat weaker than in health; and occasionally a little accelerated. In severe cases, attended with bleeding, it is usually feeble and yielding; but sometimes strong, and sometimes decidedly febrile. In debilitated cases, it may be very frequent as well as weak. Paroxysms of fever, not unlike those of hectic, occasionally attend the complaint.

The digestive system is variously affected, being in one set of cases quite healthy, in another more or less disordered, with tenderness and tension in the epigastrium, nausea, constipation or diarrhœa, and sometimes deep-seated pains in the abdomen; symptoms which indicate congestion, if not sub-inflammation of the alimentary mucous membrane, or of the whole portal circulation. Deep-seated pains in the chest and back, which sometimes occur, may indicate a similar condition of one of the thoracic viscera or the kidneys, though they may also be of a merely neuralgic character.

Much debility often attends the complaint throughout, and some patients are liable to frequent spells of faintness, or to positive syncope. In long-continued cases, the face becomes sallow or of a dingy paleness, great emaciation often occurs, and some œdema is observable of the face, in the horizontal, and of the feet, in the erect position.

The duration of the disease varies from a few days to two years or more. Slight cases of simple purpura are without danger; and even the hemorrhagic cases usually recover, though this form of the disease sometimes proves fatal, either directly by the hemorrhage, or indirectly by the suspension of the functions of a vital organ, in consequence of the extravasation of blood within it.

Old persons, especially females, are sometimes affected with ecchymosis upon the outside of the forearm, occurring in dark purplish patches of irregular shape and extent, which fade away in eight or ten days, leaving a brownish hue behind them. These recur at irregular intervals, sometimes for years, without any obvious cause, and with little or no observable ill effects upon the health. This affection is described by Bateman under the name of *Purpura senilis*. Such a case, in an elderly female, came under the notice of the author. Nothing was done for it, and the patient did not appear to suffer. The colour of the patches is sometimes very dark; and the slightest bruise produces an ecchymosis.

The *Purpura urticans* of Willan and Bateman is scarcely, I think, a pure example of this disease. It is characterized by roundish elevations of the cuticle, of a reddish colour, somewhat like those of urticaria, but without the itching and tingling which attend that affection. It is sometimes preceded by a feeling of stiffness or weight in the limbs affected, which are most commonly the legs, though the eruption sometimes appears also on the thighs, arms, and trunk. The small tumours gradually subside, assuming a darker tint, and disappearing in the course of a week, while fresh ones exhibit themselves before the others have quite faded. The usual duration is stated to be from three to five weeks. I have had under care a case which ran on for several months before recovering. The affection appears to me to be a true eruption, perhaps a variety of erythema, occurring in persons having purpura at the same time, and receiving its peculiar character from that disorder. The elevated spots, as I observed them, seemed to be owing to a distension of the blood-vessels, and not to extravasation. Proper petechiæ are frequently interspersed among them, showing the coexistence of purpura, and at the same time its partial independence of the eruption. There is nothing peculiar, so far as is known, in the cause or treatment of this variety.

Purpura is sometimes associated with other affections besides erythema. A case is recorded by Dr. Calvin Ellis, in the *Boston Med. and Surg. Journ.* (Aug. 19, 1858, p. 53), in which the disease commenced in the form of acute articular rheumatism, but eventuated as hemorrhagic purpura, with the characteristic spots on the skin, and bloody discharges from the bowels.

Anatomical Characters.—The spots upon the skin are found to be owing to blood extravasated immediately beneath the cuticle, or in the texture of the cutis itself. Blood is also occasionally observed in the subcutaneous areolar tissue, forming extensive ecchymoses. This may be washed away, leaving the vessels without any marks of injection, or other evidence of inflammation. Similar petechiæ to those upon the skin are found in the mucous membrane of the alimentary canal, and sometimes, though more rarely, and less numerously, upon the serous membranes, as the pleura, pericardium, and peritoneum. Extravasated blood sometimes exists also in the lungs, in the parenchyma of the viscera, and in the substance of the muscles. Cazenave states that, in several instances of post-mortem examination in the Hospital Saint Louis, the blood was found to be remarkably fluid, even in the tissues into which it was effused in considerable quantity.

Causes.—These are somewhat obscure. In some instances, the disease appears to arise from causes of a debilitating nature, calculated to impair the efficiency of the processes of sanguification, while, at the same time, there is a want of due material out of which the blood is to be made. Hence, unwholesome, indigestible, and scanty food, confined and impure air, indolent or sedentary habits, depressing emotions, continued fatigue, and the debility induced by various diseases, as small-pox, measles, and scarlatina, have been ranked among the causes of purpura. But the disease occurs also in individuals of good constitution, exempt from all these evils and privations, and apparently in robust and vigorous health. Suppression and retention of the menses appear to predispose to it; or possibly the two affections may be merely coincident, and dependent upon the same cause. Purpura has been known to disappear immediately after a profuse hemorrhage from the uterus. Dr. S. O. Habershon found decided evidences of disease of the spleen in two fatal cases; and, considering the part which this organ is supposed to perform in the elaboration of the blood, it is there that the cause of the disease should at least always be sought for when the opportunity is offered. (*Guy's Hosp. Rep.*, A.D. 1857, p. 89.)

Certain medicines which diminish the proportion, or impair the quality of the fibrin, occasionally appear to produce purpura. Such are the alkalies, and iodide of potassium freely used. I have seen it occur under the use of the latter medicine, and disappear upon its suspension. Mr. W. H. Vipan records several cases in which the same result followed, and seemed to depend on the use of quinia. (*Lancet*, July, 1865, p. 37.)

The disease occurs at all ages, but more frequently among the old and the young than those in middle life. The hemorrhagic variety is most common in females, and in boys before puberty. It is said to occur more frequently in the warm than in the cold seasons. Certain individuals have a strong constitutional predisposition to it.

Nature.—Purpura is probably a disease of the blood. The extravasation of blood, which characterises it, has, indeed, been ascribed to a morbid state of the capillaries. It is probable that debility of these vessels sometimes favours the effusion; but, in many instances, it is impossible to ascribe the result in any degree to this cause; for, as before stated, the complaint occurs in the robust as well as in the feeble. Nor can irritation of the extreme vessels be accused of the result; for all evidence of irritation is wanting, both during life and after death. Congestion of the venous system has also been considered as the immediate cause of the extravasation; and, if existing, must undoubtedly aid in its production; but that this cannot be the essential cause is proved by the fact, that such congestion is not a uniform antecedent or attendant upon purpura. If it be true that an excess of red corpuscles relatively to the fibrin of the blood favours hemorrhage, we have a plausible explanation of the phenomena of the disease. In the cases attended with vigorous health and a full strong pulse, there may be an excess of the red corpuscles, and the normal quantity of fibrin, as in plethora (see *Plethora*); in those of debility the fibrin may be deficient, with the red corpuscles in their normal amount, as in the blood of malignant fevers. In the former case, the disease would rank with the active, and in the latter, with the passive hemorrhages. In an examination of the blood in two cases of purpura, by Dr. Parkes, of London, the only striking result was, along with a somewhat diminished proportion of the solid constituents in general, a remarkable increase in that of iron. (See *Am. Journ. of Med. Sci.*, N. S., xix. 191.) It is not impossible that disorder in the sympathetic nerve centres, impairing their contractile influence over the capillaries, may sometimes be the proper pathological condition in purpura.

Diagnosis.—Scurvy is the only disease with which purpura is liable to be confounded. The two are, indeed, by some authors, considered identical. But the differences between them are too numerous and striking to admit of this view of their mutual relation. The following may be particularly noted. 1. In purpura there is not the same tendency to soreness, softness, and swelling of the gums as in scurvy, nor to the production of those painful tumours in the extremities, with stiffness and contraction of the joints, which so frequently attend the latter complaint. 2. The colour of the eruption is usually, on its first appearance, brighter-red in purpura, and that of the lips and tongue less pale. Indeed, the lips have sometimes in this affection a deep-purple colour. 3. The causes of the two complaints are different. The want of fresh vegetables is a prominent, if not the essential cause of scurvy. Purpura often occurs when there is no deficiency in this kind of food. The latter affection sometimes arises under circumstances, in all appearance favourable to health; the former, seldom or never. Scurvy usually shows itself late in the winter or early in spring, when fruits and vegetables are deficient; purpura in summer and early autumn, when these products abound. 4. The two complaints differ also in the treatment. Lemon-juice and fresh vegetables will generally cure scurvy, which is injured by bleeding and mercury; while purpura, which will not yield to the former remedies, is often benefited by the latter.

From all eruptive diseases, purpura is distinguished by the circumstance that the colour of the spots is not diminished by pressure. Occasionally, however, these affections are complicated with a state of system such as exists in scurvy and purpura, and then put on the livery of these latter diseases. It is sufficient to be aware of this fact, in order to make the requisite discrimination. The ecchymosis from external injuries is distinguished from purpura by its fixed local character, and the circumstances of its origin.

Treatment.—There is no specific or peculiar treatment adapted to this complaint. The most opposite measures are occasionally found necessary in different cases. In all, however, one clear indication is presented; that, namely, of amending the condition of the blood. For this purpose, the diet, which furnishes the materials of the blood, must be properly regulated, and derangements of the functions concerned in sanguification must be corrected.

In cases attended with debility, and originating apparently in causes calculated to impoverish the blood and impair generally the vital functions, such as bad or insufficient food, impure air, fatigue, anxiety, previous ill health, &c., care must be taken to supply a nutritious and digestible diet, to obviate as far as possible all other debilitating influences, and to support the system by tonics, and, if necessary, by mild stimulants, such as wine and the malt liquors. The simple bitters, the preparations of Peruvian bark, the mineral acids, and the chalybeates may be employed. Especial attention should be directed to the digestive organs. Constipation, if it exist, should be corrected by mild laxatives, as rhubarb, sulphur, castor oil, &c.; depraved or deficient hepatic secretion, by alterative doses of mercury, taraxacum, or nitromuriatic acid; and debility of stomach, by the measures particularly directed under dyspepsia. If, at the same time, the menses are retained or suppressed, aloes may be employed with chalybeates, and other means resorted to as recommended for amenorrhœa. In cases of a periodic character, sulphate of quinia should be tried, in the quantity of from ten to twenty grains in the course of a day. With all these, exercise in the open air should be insisted on as of great importance.

On the contrary, should the pulse be full and strong, the previous health of the patient vigorous, and the disease in no respect traceable to debilitating influences; and especially if, along with this general condition, local inflammatory congestions exist in the viscera of the chest or abdomen, there should be no hesitation in resorting to the lancet, an antiphlogistic diet, and active purgation; the last-mentioned remedy being peculiarly indicated when the case is complicated with constipation, or portal congestion, or both. Calomel combined with other cathartics may be employed under such circumstances with advantage. The compound cathartic pill will be a suitable combination. When the evidences of active congestion are very decided, cups or leeches might possibly be resorted to with benefit after general depletion; but they should always be used with caution, in consequence of the great liability to hemorrhage from even slight wounds. The loss of blood in cases of active purpura, if we may be allowed the term, is advantageous not only by diminishing the impulse of the heart, but also by correcting the hemorrhagic character of the circulating fluid; the effect of bleeding being, as elsewhere explained, to lessen the proportion of red corpuscles, without equally diminishing that of the fibrin.

Cases of a mixed nature may occur, in which it may be difficult to determine which of the above courses is to be preferred. A small tentative bleeding may be employed in such instances, to the extent of two or three fluidounces. If the pulse flag under the operation, and the blood, upon inspection, appear dark-coloured and indisposed to coagulate perfectly, the inference will be drawn, that depletion is not advisable. Should the contrary be the case, the remedy may be carried further. It will frequently happen, in these cases, that purgatives will act favourably even when the lancet is inadmissible. They unload the congested portal circle, and restore the digestive organs to a condition favourable to the production of a better blood. In some cases, it has been found advantageous to combine oil of turpentine with the cathartic, in pretty large doses, as a drachm or more. A mixture of oil of turpentine and castor oil has been highly praised. For the relief of congestion of the alimentary mucous membrane, refrigerant measures are often found useful, even where there may be considerable debility. Iced drinks may be employed; and the patient will frequently derive great comfort, especially when the lining membrane of the mouth and throat is hot, dry, and red, from small pieces of ice held in the mouth and allowed slowly to dissolve. Even stimulating and tonic beverages may often be usefully refrigerated in this way; the general supporting influence being thus obtained, without injury, and sometimes even with benefit to the local congestion. The alterative effect of nitre on the blood is said to have proved useful in purpura.

When hemorrhage is the prominent symptom, remedies should be employed calculated to restrain it for a time, while other plans are in operation for its ultimate cure by a correction of the blood. For this purpose, several of the vegetable and mineral astringents may be resorted to. Kino, rhatany, alum, and acetate of lead are among those best adapted to the case. Acetate of lead with a little opium will often be found useful, care being taken to obviate its tendency to produce constipation. Gallic acid has been advantageously employed. Oil of turpentine, in moderate doses frequently repeated, creasote given in like manner, and ergot may be used to meet the same indication. The tincture of larch bark, which is said to have proved efficacious, probably owes its virtues mainly to the turpentine contained in it. Dr. Eberle speaks of having successfully treated a case with nitrate of silver and oil of turpentine. Dr. Neligan has found very large doses of oil of turpentine, connected with castor oil to ensure its purgative effect, promptly successful. He gave from an ounce to an ounce and a half to adults, and from two to four drachms to children. Tincture of chloride of iron has been highly recommended. When the pulse is very frequent, with insufficient strength to justify the use of the lancet, digitalis may be combined with the other remedies. Should the disease seem to have been induced by the use of substances given medicinally, as the alkalies or iodide of potassium, these should be omitted. When the hemorrhage proceeds from accessible parts, local measures should also be used. Ice or iced water, solutions of alum and acetate of lead, and infusion of galls, kino, or catechu may be thus employed, being applied by means of cloths saturated with them, or, in case of hemorrhage from the rectum or vagina, by injection. When other means fail, mechanical measures afford a last resort. Thus, uterine hemorrhage and epistaxis may be arrested by plugging the vagina and the nostrils. The application of heat or cold to the spine is suggested by the pathological view which traces the disease, in some instances, to the ganglionic nerve centres; the one or the other of these measures being preferred, according as the centres may be considered in a state of depression or of active congestion.

Pains and restlessness should be obviated by opiates or the narcotic substitutes for opium; and emollient fomentations or cataplasms will be found highly beneficial in painful local congestions, even of the internal organs. The cold bath has been recommended, and may prove serviceable in cases having sufficient vital energy to ensure reaction.

SUBSECTION V.

DISEASES OF THE BLOOD AND BLOOD-VESSELS CONJOINTLY.

Article I.

HEMORRHAGE.

I SHALL treat first of hemorrhage generally, and then of its particular forms, in relation to the part from which it proceeds.

By the term hemorrhage is meant the escape of blood from the vessels in which it is contained in health. This is one of those instances in which, for the sake of convenience, a mere symptom of various pathological conditions has been elevated to the rank of a disease.

Numerous attempts have been made to classify hemorrhage; but all arrangements are more or less defective; because the different morbid states of the system upon which the affection is dependent frequently coexist, and any category which can be formed must contain varieties belonging also to another; and, besides, during life, it is often impossible to decide as to the real existing pathological condition. The following are divisions which have been recognized by different authors.

Hemorrhage has been divided into *traumatic* and *spontaneous;* the former including those instances in which a vessel has been directly divided, or ruptured by a wounding body, the latter, those in which the flow of blood proceeds from some cause acting through the organization. But it is often impossible to decide whether the hemorrhage is or is not traumatic; for the violence, instead of directly dividing the vessel, may have operated through the medium of a sudden congestion, or an increased force imparted to the heart's action; and the term *spontaneous* implies the obvious fallacy, that a flow of blood may take place of its own accord, without any other cause than that which is inherent in itself. Besides, the hemorrhage which proceeds from a wound inflicted by a calculus in the pelvis of the kidney, or by hardened feces upon the hemorrhoidal vessels, though strictly traumatic, often cannot be distinguished from a so-called spontaneous hemorrhage.

Another division is into the *symptomatic* and *idiopathic or essential;* both of which are embraced in the spontaneous. *Symptomatic hemorrhage* is that which results from some other recognized morbid state, as malignant fever, tuberculous or cancerous disease, inflammation, ulceration, aneurism, &c.; *idiopathic* or *essential*, that which itself constitutes the disease, without the necessary existence of any other derangement. But, strictly speaking, hemorrhage is always and necessarily symptomatic. It is impossible to conceive of a discharge of blood, without a morbid state of the vessel from which it proceeds, of some other part of the structure, or of the blood itself. The disease may be latent; but it must nevertheless exist. There is, therefore, no ground for such a division; and, even admitting into the rank of idiopathic hemorrhages all those which have their origin in some deviation, not hitherto recognised, from the normal state, still, it is frequently altogether impossible to decide, during life, whether any particular case ought to take this position; for it cannot be told whether there may not be irritation, inflammation, or some peculiar degeneration of the part affected, or some other part, which may be the real cause of the discharge.

Again, hemorrhages have been divided into *active* and *passive*, according as the vital forces or vital actions are above or below the standard of health.

But this division, though to a certain extent founded in truth, fails, if intended to be of universal, or even of general application. There are, undoubtedly, many cases of hemorrhage, in which the discharge appears to be essentially associated with a state of local or general excitement, and a display of increased vital force, and others which have their origin in a quite opposite condition; but there are also many in which neither of these states can be said to exist, and we not unfrequently meet with cases in which general debility is connected with irritation or excitement in the part affected.

Other denominations of hemorrhage are *constitutional*, in which the discharge was originally connected with the ordinary health of the individual, or has by habit become essential to that state; *vicarious*, in which a hemorrhage from one part has been superseded by another, from an unconnected and perhaps distant part; *critical*, in which the hemorrhage occurs in the progress, or at the close of any disease, marking, and perhaps producing either a decided amelioration, or a sudden aggravation of the symptoms; *periodical*, in which it occurs at definite intervals; *arterial*, in which the blood proceeds from arteries; and *venous*, in which it proceeds from veins. How far there are grounds for these distinctive designations will appear in the course of the following remarks.

Without insisting on any general classification of hemorrhage, I shall endeavour to attain the more important end of ascertaining, as far as practicable, the different pathological conditions in which this morbid phenomenon is exhibited, as one of the characteristic symptoms or results.

1. *Rupture or other division of the blood-vessels, in a previously healthy condition.*—This may be the result either of direct violence from causes properly extraneous to the system, as wounds, blows, &c., or of distension of the vessels, produced by causes essentially connected with the economy itself. As a general rule, it is only hemorrhage proceeding from the latter source, that falls within the domain of medical pathology. Cases do, indeed, occasionally come under the care of the physician, in which a vessel is divided by an internal wounding body, as those before alluded to of hæmaturia from calculus in the kidney, and hemorrhoidal flux from hardened feces; but these are exceptions; and, generally speaking, the surgeon has the charge of all hemorrhages resulting from direct extraneous violence. Our attention, therefore, will be confined to those in which the rupture occurs from some vital agency, exerted through the functions of the system That this occasionally happens in perfectly healthy vessels can scarcely admit of a doubt. Of course, congestion arising from an irritation seated in the vessels themselves is here excluded from the list of causes, because the vessels are in this condition not in a perfectly healthy state. There are two modes in which the distension producing rupture may arise; *first*, from the excessive force with which blood may be thrown into a particular part of the body, and *secondly*, from its great accumulation in the part, in consequence of some impediment to its return. As examples of the first, may be adduced distension of the pulmonary vessels, arising from hypertrophy and consequently increased power of the right ventricle of the heart, and a similar state of the cerebral vessels from a similar condition of the left ventricle. It is true that, in hypertrophy of the left ventricle, the increased force is felt more or less throughout the frame. But the head, from its position, as well as from the great proportional quantity of blood thrown into it, is peculiarly exposed to the morbid impulse, and, therefore, most apt to feel its effects. Any excessive action of the heart, proceeding either from physical or moral causes, may produce the same effect. Still it may be doubted whether, in these cases, a rupture of the vessels would take place if perfectly sound; and it is impossible to prove the fact, because it is impossible to show that the vessels, in case of rupture, may not have been more or less diseased.

Certainly, the impulse must be unusually violent, which is necessary to produce this effect; otherwise, the cases of hemorrhage from this cause would be much more numerous than they are. That they do, however, sometimes occur, I am disposed to believe, partly from the occasional suddenness of the hemorrhagic attack in apparent health, and partly from the consideration, that the coats of the vessels, having been made capable of rupture, must give way before a sufficient force; and there is no reason to suppose that this may not be supplied by the heart, when acting with its utmost power, especially when this power has been greatly augmented by a morbid development of the muscular structure of the organ. Morbid accumulation of blood from impediment to its return, mentioned above as one of the probable causes of rupture of the healthy vessels, may proceed from certain organic diseases of the frame itself, or from temporary influences interfering with the due course of the circulation. Disease of the valves of the heart, or inequality in the size of its cavities, enlargement of the liver interrupting the return of blood through the vena portarum and vena cava, and scirrhous tumours diminishing the cavity of veins in their neighbourhood, are examples of the first; external compression by ligature or otherwise, certain postures which oppose the agency of gravitation to the natural course of the blood, and diminished atmospheric pressure acting especially on the Schneiderian and bronchial mucous membrane, are examples of the second. But the most frequent cause of the vascular distension which leads to rupture is, probably, a combination of the two conditions of increased force of the blood and impediment to its return. Such a combination is produced by excessive muscular efforts, as the lifting of heavy weights and other violent straining, which at the same time stimulate the heart to greatly increased action, and compress the abdominal and external veins, thus causing accumulation of blood in the more protected cavities of the head and the chest. When these causes act conjointly with hypertrophy of the heart, or other favouring organic affection, we have the condition of things most conducive to vascular rupture.

2. *Rupture or other division of blood-vessels, in a previously morbid state.*—The diseased condition of the vessel may be merely functional. Upon principles already explained (see *vol.* i. *pp.* 53–5), irritation invites a flow of blood to the part affected, and thus occasions congestion. This may possibly exist to such a degree as to rupture the coats of vessels otherwise healthy, especially when aided by an increase of the *vis a tergo*. Violent passion, producing irritation and congestion of the brain, may occasion rupture of the cerebral vessels, and excessive exertion of the voice may produce a similar effect in those of the air-passages. But the morbid state of the vessel leading to rupture or other solution of continuity, is probably much more frequently organic. The coats of the vessels may be softened by previous inflammation; or thinned by absorption, in consequence of pressure from scirrhous tumours or tuberculous deposit; or weakened by fatty degeneration; or otherwise diseased, so as to render them more brittle and less capable of resistance than in health, as in cases of aneurism. In all these instances, they may yield to the ordinary force of the circulation; though, much more frequently, the rupture will be likely to take place under circumstances calculated to produce an unusual distension of the vessels, as explained in the preceding paragraph. Another condition leading to solution of continuity in the blood-vessels is ulceration, whether of the ordinary character, or such as attends the progress of tuberculous and cancerous disease. Hence, in part, the frequency of hemorrhage from the bowels in typhoid fever, from the lungs in phthisis, and from the stomach in cancer of that organ. Still another source of hemorrhage, belonging to this category, though it comes more frequently under the notice of the surgeon than the physician, is the sloughing which follows mortification of the vessels.

3. *Active elimination from the vessels, without rupture.*—Opinion formerly referred almost all hemorrhages to rupture or division of the vascular parietes. The observations of Morgagni long since threw some doubt upon the correctness of this hypothesis as one of universal application; but it was reserved for Bichat completely to change the current of medical sentiment upon this subject. The surfaces from which fatal hemorrhage had proceeded were carefully examined after death by this accurate observer, without exhibiting any marks of a ruptured vessel even under the microscope; and his observations were confirmed by subsequent pathologists. The cases were comparatively rare in which any laceration, or other solution of continuity, could be discovered. The inference was obvious, that the hemorrhage probably occurred by transudation through natural pores; though it must be confessed that the evidence was not conclusive; for the rupture may possibly have existed, and yet escaped attention. The aid of other considerations, therefore, was necessary to establish the fact of transudation. One of these was the condition of things in menstruation. The internal surface of the uterus has been examined during this process, in a case of complete prolapsus, and the menstrual discharge observed oozing by drops, in the manner of any other secretion. (*Cyc. of Pract. Med.*, article *Hemorrhage.*) It is true that, in this case, the blood may be somewhat altered, constituting a kind of secretion rather than a hemorrhage; but the fluid bears so close a resemblance to unaltered blood, that, so far as concerns their mode of escape from the vessels, what is admitted of one, may, without any great violence to probability, be admitted of the other. In the progress of inflammation, there is very frequently an extravasation of blood, along with coagulable lymph, in the tissue or on the surface of organs; and there could be little doubt, it was thought, that the fluid is eliminated here by a simple transudation. What happens in inflammation may readily be supposed also to happen in mere irritation. But still more strongly confirmatory of the idea, that hemorrhage might be simply transudation, was the well-established fact, that blood had, in several instances, been seen issuing from the surface of the skin, without any rupture of vessels, oozing through the pores in fine drops like dew, and, when wiped away, reappearing in the same manner several times successively. (Sir Henry Marsh, *Dub. Quart. Journ. of Med. Sci.*, xii. 260.) As the possibility of the escape of blood through the natural pores of the vessels seemed thus to be proved, and as the most minute post-mortem examination had generally failed to discover any rupture of the vascular coats in cases of hemorrhage, there appeared to be good grounds for the prevalent opinion in relation to the character of this affection. But this opinion has again begun to yield to the old notion of rupture of the vessels; for microscopic investigation has never detected pores in the capillaries sufficiently large to admit the passage of the blood corpuscles, or in fact any pores whatever; and it is to be inferred that blood, unless with a previous destruction of the corpuscles, could not transude through the coats of the vessels. Nevertheless, it is scarcely probable that rupture can take place in so many countless contiguous points, as must happen in cases of oozing of blood if the theory of rupture is true; and it would seem also a very clumsy provision of nature, in the case of menstruation, to effect a normal function through a mechanical bursting of the vessels. The probability appears to me to be, that pathological solutions of continuity take place in the capillaries, in a state of congestion, by which openings are effected sufficient for the escape of the corpuscles, and closed when the immediate occasion of their formation is passed. That such openings, under vital laws, may take place in the delicate walls of the capillaries, and afterward close, is easily conceivable, when it is considered with what rapidity a number of the ultimate cells, placed in a line, are formed into a tube by disappearance

of their walls at the points of junction, and how rapidly capillary vessels are formed in new structure. Therefore, though the blood cannot be said to pass unchanged through the unchanged walls of the vessels, yet its escape may not be altogether mechanical, but may be caused and regulated by certain physiological laws, which place the resulting hemorrhage rather in the position of transudation from the vessels, than in that of the mere result of rupture. What circumstance it is that, in certain cases of irritation, disposes to the elimination of blood, rather than of those fluids which are observed in other cases, it is impossible, in the present state of knowledge, to do more than conjecture. It may possibly be owing to the state of the blood itself, which, as will hereafter be more particularly explained, is often peculiarly affected in hemorrhagic cases. That the hemorrhage, whatever may be the mode of escape from the vessels, is often the result of local irritation, is proved by the fact, that its appearance is preceded and attended by a feeling of weight, fulness, warmth, oppression, &c. in the part from which it proceeds. It may or may not be associated with a state of general vascular excitement; and it is by no means incompatible with general debility.

4. *Passive elimination, without rupture.*—It is easy to conceive that the coats of the capillary vessels possess a degree of tonicity, or vital organic contractility, which, in full health, prevents the escape of the blood; and that a diminution or loss of this power may result in such a relaxation as to permit that fluid to pass. We see this event of very frequent occurrence, after death, from the mere influence of gravitation. In a state of debility approaching death the same result might be expected, especially as there is now a certain degree of the *vis a tergo* to act as the extravasating force. But the tone or contractility of capillaries is not necessarily lost in the same degree as the energy of those organs immediately necessary to life. Death may, therefore, and frequently does take place without hemorrhage. It is only in cases in which the capillaries themselves are greatly relaxed that this phenomenon would be likely to occur. When this happens in connection with considerable remaining activity of the circulation, we may look for hemorrhage. Hence, perhaps, in part, the frequency of this affection in low and malignant diseases. In such cases, if the explanation given be true, the hemorrhage should be more or less general; and, accordingly, in these diseases, there appears to be a tendency of the blood to escape by various avenues, especially from the mucous membranes, in which the least degree of mechanical resistance is opposed. It is possible, however, that the debility or loss of tone may be confined to the vessels of a particular part or organ; and we may thus have passive hemorrhage as a purely local affection. The same difficulty in admitting the escape of the unbroken blood-corpuscles through the unruptured walls of the vessels, exists in this case as in that of active hemorrhage, and may be explained in the same way. But, in this variety of hemorrhage, it often happens that the blood is in some degree dissolved while in the vessels, the corpuscles being ruptured, and their red contents diffused through the general mass of the fluid. In such a case, even the microscopist sees no impossibility in the escape of the blood, or at least the fluid part of it, through the capillaries by mere transudation.

Hitherto our attention has been directed to the condition of the vessels from which the hemorrhage proceeds. There are, besides, morbid states of the system, which are essential in some forms of hemorrhage, and, therefore, require notice in this place. They may be divided into those affecting the circulation, and those which have their seat in the blood. In considering them, some repetition of what has been already said will be necessary to a full and consistent view of the subject.

5. *Morbid states of the circulation in hemorrhage.*—In many instances,

there is a morbid activity of the circulation, which precedes and accompanies the hemorrhage, and probably contributes essentially to its occurrence. This is especially associated with that form of the disease which depends upon irritation of the bleeding vessels. Sometimes it is so considerable as to constitute a genuine febrile attack, being attended with rigors at the commencement, with loss of appetite, and even with disordered nervous phenomena. It does not bear any fixed relation to the degree of local vascular irritation, and is probably, therefore, in many instances at least, wholly independent of it. Its origin, like that of many other forms of fever, is obscure, but is, not improbably, connected with the condition of the blood.

Another frequent derangement of the circulation is that of increased vigour arising from hypertrophy of the heart. This has been already alluded to, in the paragraph which treats of a solution of continuity in the coats of healthy vessels. Its force is directed to different parts, according as one or the other cavity of the heart is affected; to the lungs, for example, when the disease is seated in the right ventricle, to the brain, when it is seated in the left. It is highly probable that, when aided by accidental causes, which may concentrate its force upon a particular organ, it is capable of effecting the rupture even of a healthy vessel. That it often produces this effect in vessels organically diseased, or even greatly debilitated, there can be no doubt. But it probably operates, in the greater number of cases, by producing an irritation or excitement of the vessels in consequence of the superabundance of blood furnished to them, and thereby inducing an elimination of this fluid through their coats in the manner already explained.

A third deranged condition of the circulation, attending and producing hemorrhage, is that dependent on some impediment offered to the return of blood through the venous trunks. One example of this condition is presented by inequality in the cavities of the heart, and by constriction or imperfection of the cardiac valves. The modes in which these organic affections produce inequalities in the circulation have been already fully explained, in the articles on hypertrophy and dilatation of the heart, and on chronic valvular disease of that organ, to which the reader is referred. Another example of congestion from impediment to the return of blood is afforded in those organic derangements which have the effect of narrowing the capacity of the great veins. Thus, enlargement of the liver, diminishing the caliber of the vena cava ascendens, and of the vena portarum, produces congestion of the whole portal circulation, and predisposes, if it does not actually give rise to hemorrhage from the stomach and bowels. This sort of passive congestion may act, in producing hemorrhage, conjointly with any of the pathological conditions of the vessels above described, proceeding from other causes; or it may be itself the primary agent, by inducing a hemorrhagic irritation in the vessels of the congested organ. It may possibly even occasion a rupture in healthy vessels, when aided by some accidental cause, giving a direction of the blood strongly to the affected part.

6. *Morbid states of the blood.*—These may have relation either to quantity or to composition. The blood may be in excess, constituting plethora, which is one of the most fruitful sources of hemorrhage. The mode in which this may operate is too obvious to require explanation. Its influence has been long and universally recognized. But the influence of an altered condition or composition of the blood has but recently begun to be understood; at least it is only of late that any precise knowledge upon the subject has been obtained. From the experiments and observations of Magendie and Andral, it appears that a deficiency of fibrin in the blood, relatively to the proportion of red corpuscles, strongly predisposes to hemorrhage. It may, indeed, produce the effect without the co-operation of any discoverable lesion or other

morbid state, and very much favours the action of hemorrhagic causes in general. According to Andral, there are two conditions of the blood, in relation to the proportion of its fibrin and red corpuscles, both of which are favourable to hemorrhage, but which differ greatly in their attendant phenomena. In one, the proportion of fibrin to the general mass of blood is the same as in health, but there is an excess of red corpuscles, and the fibrin, therefore, does not bear its usual proportion to the latter constituent. This condition is observed in plethora, and disposes to the production of the hemorrhages usually denominated *active*. In the other, there is a positive deficiency of fibrin, while the proportion of red corpuscles is undiminished. This condition is much more favourable to profuse hemorrhage than the preceding. It is supposed to occur in purpura, malignant fevers, &c.; and constitutes one of the characteristic features of *passive* hemorrhages. The ordinary phenomena which mark these two forms of hemorrhage, and consequently indicate the character of the blood in each, will be detailed among the symptoms. Andral believes that the blood, in either case, never presents the buffy coat, unless the disease be complicated with inflammation. The clot is usually large in consequence of the abundance of red corpuscles, and soft from the deficiency of fibrin. By the loss of blood in hemorrhages the quantity of red corpuscles is diminished more rapidly than the fibrin; the two are at length brought into their normal proportion; and the hemorrhagic tendency ceases. What it is that produces originally the deficiency of fibrin in the blood has not been satisfactorily ascertained. It has been ascribed to an excess of alkali, altering the character of this principle, and rendering it uncoagulable. But no such excess has been proved to exist generally; and any attempt to investigate the question further would throw us into the unprofitable field of mere conjecture. Nor is it much better understood, in what manner the deficiency of fibrin occasions the result ascribed to it. We may suppose that the stimulus of a certain proportion of this principle is necessary to preserve the capillary pores in their due state of vital contraction, that relaxation consequently results from the want of it, and the blood passes through from the force with which it moves. This may happen in the passive hemorrhages. We may suppose, moreover, that, in local irritations, a strong disposition of the blood to coagulate may cause the first extravasated portion to become concrete, and thus close the orifices, before it has penetrated the tissue which intervenes between the vessel and the air. We know that this happens in inflammation, in which there is an excess of fibrin. Whether, therefore, any existing irritation is to end in inflammation or hemorrhage may, according to this view, depend upon the excess or deficiency of fibrin. In the former case, the extravasated blood coagulates before it escapes externally, closes the orifices, and gives rise to the phenomena of inflammation. In the latter case, the blood, remaining fluid, penetrates the basement membrane and cuticle or epithelium, or whatever separates the capillary from the air or the adjacent cavity, and, being thus removed, is followed by another portion from the irritated vessel; so that a hemorrhage is established, which tends to relieve the irritation by unloading the vessels, and thus leads to its own cure. The last remarks are of course applicable to the active hemorrhages. It must be confessed, however, that this explanation, both as relates to the passive and the active hemorrhages, is, in great measure, hypothetical.

The above, so far as occurs to me, are all the morbid conditions which essentially attend hemorrhages in one or another form, and which strictly constitute the disease of which the hemorrhage is a symptom. Two or more of them often coexist; and the hemorrhagic tendency must bear some proportion to the degree of this complication. Thus, organic disease or high irritation of certain blood-vessels may be joined with febrile excitement, plethora, deficiency of fibrin in the blood, and finally hypertrophy or dilatation of the heart. An escape from hemorrhage, under these circumstances, would be improbable.

There is no portion of the body where hemorrhage may not occur, whether the free surfaces of the mucous membranes and the skin, the serous and synovial membranes, the areolar tissue, the parenchyma of glands, and other organs, as the lungs, spleen, &c., the substance of the brain and spinal marrow, or even the bony structure. So far, however, as the affection is peculiar in each situation, it will be treated of under the head of particular hemorrhages.

Symptoms, Course, &c.—When the hemorrhage takes place from a part communicating externally, the discharge is generally sufficiently obvious to the senses; but the same is not the case when the blood is effused into a close cavity, or into the substance of an organ. Under these circumstances, the diagnosis is often difficult. The distension, the sense of fulness and oppression, the greater or less disturbance of the functions of the organ or organs exposed to pressure and irritation from the effused blood, the existence of fluctuation in those cases which admit the application of this test, the signs of extravasated liquid afforded by percussion and auscultation, the suddenness of the attack, and the absence of phenomena which would indicate another origin for the symptoms, are the evidences of internal hemorrhage chiefly to be relied on. When the blood escapes externally, it is not always easy to decide upon the exact source of the hemorrhage, as, in more than one instance, several organs, from any one of which it may proceed, have the same outlet. The judgment will be influenced, upon this point, by the mode in which the blood is discharged, by the evidences which it presents, in its greater or less freshness, of the length of its detention after extravasation, by the substances with which it is mixed, by the alteration which it has undergone under the influence of certain known chemical or vital agents, and by the phenomena which would call attention to one or another organ as the seat of disease.

There are no certain limits to the amount of blood discharged. It may be only sufficient to stain the secretions with which it may be mixed, or may be so great as to be incompatible with life.

The character of the blood is exceedingly diversified. It is sometimes pure, fresh, and quite liquid, as if immediately from the blood-vessels; sometimes partially or quite coagulated; sometimes mixed with air, or with various secretions, or with the accidental contents of the cavity in which it may have been for a time retained. In some instances, it is much altered by the influences to which it may have been exposed before reaching the surface, as by that of the gastric juice in the stomach. It may be coagulable, as in the active hemorrhages; or but partially coagulable, or altogether incoagulable, as in those which attend malignant fevers. In colour it is sometimes red, and sometimes more or less approaching to black. It has been conjectured that, when bright-red, it proceeds from arteries, and, when dark, from veins; but colour affords no certain evidence. The blood is, in many instances of disease, dark-coloured in the arteries; and it often becomes so when retained for a short time after extravasation. It proceeds in general from the capillaries. The only certain cases of venous hemorrhage are those proceeding from the rupture of a vein, as sometimes happens in hemorrhoids.

The hemorrhage may or may not be preceded or attended by symptoms indicating irritation or congestion of the part affected; it may or may not be accompanied with excitement of the circulation and other symptoms of febrile action. There is generally some derangement of the bleeding organ, in consequence of the interference of the effused blood with its functions. Thus, in hemorrhage of the lungs there is more or less oppression and cough; in that of the stomach, nausea and vomiting; in that of the bowels, griping and diarrhœa. Sometimes this interference is so great as to endanger or destroy life; as in the case of hæmoptysis, which is occasionally, though very rarely, so abundant as to produce suffocation. The danger is much greater when the hemorrhage takes place in close cavities, or the substance of organs, than in those cases in which the blood has the opportunity of escaping. Thus, effusion of blood within the cranium often produces fatal apoplexy; within the pericardium, syncope; within the pleura and peritoneum, inflammation of these membranes respectively.

It has been already stated that the system is in a very different condition in different forms of hemorrhage; sometimes exhibiting evidences of excitement, sometimes of depression both general and local. Hence has arisen the division of hemorrhages into *active* and *passive*. It must not, however, be understood that all hemorrhages are included in these two classes. Many cases exist, in which there are no signs either of increase or diminution of the vital powers or actions. It not unfrequently happens, moreover, that general depression or debility is associated with local irritation. Again, a state of great prostration is frequently induced by the hemorrhage itself which must not be confounded with the debility that sometimes occasions, or at least favours the origin of hemorrhage in other cases. Nevertheless, the distinction is sufficiently obvious, and general in its application, to be of practical importance. It will be proper, therefore, to detail the symptoms by which the two conditions may be recognized respectively.

In the *active hemorrhages*, signs of irritation or active congestion in the part affected often precede the eruption of the blood. These are somewhat different in different organs. Among them are a sense of oppression, fulness, weight, warmth, titillation, and even pain; and, when the part is visible, an obvious redness, vascular distension, and increased force of pulsation in the neighbouring arterial trunks. Simultaneously with these symptoms, coolness of the extremities and rigors sometimes occur, followed by febrile reaction; and both the local and general disturbance continues usually, to a greater or less extent, for some time after the first appearance of the hemorrhage, though the discharge has a tendency to relieve it. The blood is generally bright-red and coagulable; but the clot is in most cases large and soft, and, according to Andral, there is no buffy coat, unless the affection be complicated with inflammation. It contains, according to the same authority, an excess of red corpuscles without a corresponding increase of fibrin. The hemorrhage proceeds only from one organ, and not from various parts of the body at the same time, as often happens in the passive hemorrhages. The affection is said to occur most frequently in young, robust, and florid individuals, accustomed to full living, without sufficient exercise; circumstances which strongly favour the production of a plethoric state. But it is not unfrequent also in a very different habit of body, in meagre and delicate persons, in whom there is a rapid production of blood in consequence of a vigorous digestion, without a corresponding tendency to its expenditure in the process of nutrition. When not associated with organic disease, active hemorrhage in general readily yields to treatment.

Passive hemorrhages are neither preceded nor attended by local or general excitement, unless some other disease exists at the time, such as a malignant fever, of which the hemorrhagic affection is a mere accompaniment; and, even in such cases, the excitement is of a feeble character, such as is produced by some irritant or stimulant influence, operating upon real debility. On the contrary, the symptoms are those of a depressed condition alike of the vital forces and vital actions. There is a feeling of languor, a deficiency of muscular strength, and weakness of the circulation, though the pulse is sometimes more frequent than in health, especially during exertion. The capillaries are indolent; the blood circulating very slowly through them, and imparting, in consequence of its stagnation, a somewhat dark hue to the surface, which is otherwise pale. Pressure often occasions the marks of a bruise, and slight contusions give rise to ecchymosis. The blood which escapes is dark-coloured, sometimes almost black, and little disposed to coagulate, or altogether uncoagulable. The serum and clot separate but imperfectly, and the latter is seldom or never cupped. The fibrin is deficient, while the red corpuscles are undiminished. Sometimes the blood is like reddish serum. The hemorrhage is not usually confined to one organ; but blood escapes at the same time from different points of the mucous surfaces, and is not unfrequently extravasated into or beneath the skin, forming petechiæ and ecchymoses. The affection is much less frequently original than attendant on other recognized diseases, as malignant small-pox and scarlatina, typhus fever, scurvy, and purpura.

When hemorrhage is considerable, it usually produces signs of depression, such as weakness of pulse, paleness of face, coolness of the extremities, nausea, faintness, vertigo, and cold sweats; when sudden and very copious, it may even induce syncope, preceded in some instances by convulsions. But the depression of the circulation usually causes a suspension of the hemorrhage, before it reaches the point of absolute fainting. The fears of the patient not unfrequently co-operate with the loss of blood in producing signs of depression; and sometimes, when the hemorrhage is too slight to occasion directly any constitutional effect, great paleness and apparent prostration result from the former cause alone. The ultimate effects of profuse, or often repeated hemorrhage, are those described under the head of *Anæmia.* (See *page* 273.) An important fact, ascertained by Andral, is that it produces a diminution of the red corpuscles, without lessening in any considerable degree the healthy proportion of fibrin, unless very copious or prolonged. Hence, one of the effects of hemorrhage is to remedy that condition of the blood which favours its production, and thus to cure itself.

Hemorrhage is very apt to return after being arrested, in consequence of the persistence of the causes in which it originated. Generally the periods of its return are altogether irregular, depending on the casual influence of exciting causes, during the continuance of the predisposition. Sometimes it assumes a periodical form, returning at certain stated intervals. When it occurs once a year, as occasionally happens, the result may be reasonably ascribed to the influence of the season; when daily, or every other day, it is probably under the operation of those causes which lead generally to periodicity in disease. (See *vol.* i. *page* 215.) The most common interval is that of a month; and this is most frequent in females with suppression of the menses, in whom the hemorrhage may be considered as vicarious to that discharge. Even in men there is sometimes a monthly recurring hemorrhage, especially from the hemorrhoidal vessels, which seems designed to relieve a periodical plethora, and may be considered, therefore, as entering into the health of the individual. Some believe that, in the male as well as the female system, there is a monthly flux and reflux of vital action, which sometimes becomes excessive at the full, and relieves itself by some discharge, especially by hemorrhage. Without admitting the generality of this fact, we may allow that such an analogy of the male with the female system does occasionally exist, and may thus account for some of the periodical hemorrhages which take place in individuals of the stronger sex. In such cases, the same premonitory symptoms are exhibited as by women before menstruation; and the same dangers are incurred by the suppression of the discharge. Another analogy of this form of hemorrhage with menstruation is, that it is apt to cease at a certain period of life.

By the frequent repetition of hemorrhagic discharges, even when of accidental origin, the system sometimes becomes, at length, habituated to them. The processes of digestion and sanguification acquire an activity, which serves to secure the health against material injury, by supplying an additional quantity of blood equal to that lost. The hemorrhage then almost ceases to be morbid; and its hasty suppression would endanger plethora, and consequent hemorrhage in other, and, perhaps, more hazardous situations. Thus, the suppression of an habitual discharge of blood from the rectum may cause hæmoptysis, or a fatal apoplexy.

Constitutional Hemorrhage.—In some persons, a strong constitutional tendency to hemorrhage exists, so much so that the slightest causes will often bring on an attack, and, when the blood begins to flow, it is exceedingly difficult to arrest it. A slight wound, even the scratch of a pin, will sometimes occasion a serious and even alarming hemorrhage. Contusions, which would not be noticed in ordinary persons, induce extensive ecchymoses; and blistered surfaces occasionally bleed profusely. The hemorrhage often also comes on spontaneously, or from the least unusual effort, as from coughing, sneezing, or straining at stool; and, when the predisposition is very strong, blood sometimes issues simultaneously from all the mucous surfaces; while extravasation takes place also beneath the cuticle, and in various internal parts of the body. Dr. Magnus Huss, of Stockholm, relates the case of a woman, in whom the hemorrhage took place from about the roots of the hair of the head, of the eyelashes, and sometimes of the hair in other parts of the body, as in the axilla. The blood escaped drop by drop from the follicles. (*Arch. Gén.*, Août, 1857, p. 169.) The individuals thus constitutionally affected do not appear to have the same liability at all times; for causes which are sufficient to produce copious hemorrhage on one occasion, appear to be inoperative on another. The attack is often attended with a quick irritated pulse; and not unfrequently with febrile action, which appears to increase the hemorrhagic tendency. Contrary to what might have been expected, it is asserted that, at least in the beginning, the proportion of fibrin is not diminished.

This constitutional predisposition is sometimes a family peculiarity, being found in several children of the same parents, even when the father and mother have exhibited no such tendency. It is also not unfrequently inherited, passing even through several generations, and occasionally, like other hereditary affections, omitting one generation to exhibit itself in that immediately succeeding. The attention of the profession in this country appears to have been first specially called to it by the late Dr. Otto, of Philadelphia, in the year 1803; and numerous very interesting instances of this family peculiarity have been since recorded in the journals.* Among the most striking are those given by Dr. Riecken.† Out of a family of twelve children four died of hemorrhage; and a sister, who escaped and became the mother of six children, lost three of them by the same disease. The preferable direction of this family predisposition to the males has been noticed in almost all published accounts. Of 484 cases collected by Grandidier, 452 were in males, and 32 in females. (*Arch. Gén.*, Août, 1857, p. 187.) Nothing has been noticed in the habits or previous health sufficient to account for the peculiarity. It seems, in some instances, to have been associated with a rheumatic or gouty diathesis; and has displayed itself chiefly in the young. In the cases referred to by Dr. Hughes (see *note*), the tendency to hemorrhage diminished as the patient advanced in life, and in old age was replaced by rheumatism. By far the larger proportion occur very early in life. Of 65 cases collected by Grandidier, 46 began within the first year, 5 between one and two, 2 at twenty-two years, and none later than the last-mentioned age. (*Arch. Gén.*, *ut supra.*) Several instances are on record, in which infants at the breast were attacked in consequence of emotion experienced by the mothers who gave them nourishment. (*Ibid.*, Mai, 1863, p. 596.) The appearance of the disease has been often connected with disturbance of innervation, having for its effect a diminution of the tonicity of the capillaries (*Ibid.*, p. 598); and this can be readily understood, when the influence of the sympathetic centres over the contractility of the extreme vessels is taken into consideration. In a large proportion of the cases, the affection sooner or later proves fatal.

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* See papers by Dr. Otto in the *N. Y. Med. Repository* (vol. vi., A.D. 1808), and in *Coxe's Med. Museum* (vol. i., A.D. 1805); an interesting paper by Dr. Reynell Coates in the *N. Am. Med. and Surg. Journ.* (vi. 37); a communication by Dr. J. N. Hughes in the *Transylvania Journ.* for April, 1832; and various notices in the *Am. Journ. of Med. Sciences* (ix. 192, and N. S., v. 202); and in the *Med. Examiner* (v. 344 and 475).

† *Am. Journ. of Med. Sci.*, ix. 201, from *Medizinisch-chirurg. Zeitung*, Nov. 15, 1830.

The state of system, attending this constitutional disposition to hemorrhage, is probably very nearly the same as that which exists in hemorrhagic purpura. The blood has been observed, in some cases, not to be coagulable; and there is reason to believe that the whole difficulty may have its origin in a deficiency of fibrin, either positive, or relatively to the red corpuscles.

Critical Hemorrhage.—Near the termination of certain diseases, or at certain periods in their course, hemorrhage sometimes occurs, with the apparent effect of relieving the morbid action, and even of putting an end to the complaint. The discharge, however, may prove too copious, and, instead of relieving, may aggravate the danger, and even lead to a fatal result. Such hemorrhages have been called *critical.* They differ, however, in nothing from ordinary hemorrhages, which are almost always the result of a morbid state of system preceding the attack, and not unfrequently serve to remove that state. The only apparent difference is, that, in the one case, the antecedent disease is obvious and well known, in the other, is perhaps concealed.

Hemorrhage is seldom fatal by its immediate effects, unless in cases of organic disease of the vessels, as in aneurism; or where the escape of the extravasated blood is prevented, and the functions of vital organs are interfered with by its accumulation, as in apoplexy.

Causes.—Many of the remarks which might have been made here, have been necessarily anticipated in the preceding sections. The immediate cause of hemorrhage is often nothing else than the pathological condition of which it is a symptom, and this has been already considered in all its obvious diversities. Our attention, in this place, will be confined to the agencies through which the pathological condition is produced. Considered in this light, we must rank, among the causes of hemorrhage, 1. whatever produces a direct division of the coats of a blood-vessel, whether operating from without, as wounds, bruises, and other kinds of violence, or internally, as calculous concretions in the urinary organs; 2. all those influences which induce over-excitement of a part liable to hemorrhage, including excessive exercise of the organ, as of the lungs in speaking, or of the brain in thought or passion; the local application of stimulants or irritants, as of alcohol to the stomach, or of acrid vapours to the lungs; partial exposure of the body to heat, as in the case of cooks who are in the habit of stooping over the fire; and the direct or indirect action of cold; 3. whatever contributes to give the blood an unusual impulse towards any organ, or to impede its exit from the organ; as lifting weights, wrestling, straining violently at stool, or any other excessive muscular exertion; diminished atmospheric pressure; the unequal action of the different cavities of the heart; certain postures; and everything that diminishes the caliber of the venous trunks, whether from without or within the body; and 4. whatever increases the fulness of the blood-vessels, or the force of the heart's impulse, as animal food in excess, especially conjoined with sedentary habits, stimulating drinks and condiments, violent exercise, exposure to heat, excitant emotions, the amputation of a limb, and the suppression and diminution of habitual discharges. The period of life has also considerable influence as a cause of hemorrhage, probably by giving rise to plethora. The age at which the affection is most common, is that at which the body has nearly or quite attained its full height. There is apt, at this period, to be a loss of balance between the processes of sanguification and nutrition. As the blood is no longer wanted to supply the growth of the body, it is not expended so rapidly as before; while the functions by which it is elaborated do not always abate in their activity proportionably to the diminished demand. It therefore accumulates in the blood-vessels, and may thus readily become a source of hemorrhage. Among the remote causes, we must also rank those which occasion a deficiency of fibrin in the blood. Of these, however, we know too little to admit of a positive enumeration of them; but there is reason to believe that unwholesome diet has much influence. Certain noxious effluvia, such as those which generate typhus fever; and certain nervous influences, not well understood, but especially those of a depressing character, probably have a similar tendency. It is probable also that the excessive and long-continued use of alkaline substances may produce the same effect; as the presence of an excess of free alkali in the blood is said to impair its coagulability.

Treatment.—The first consideration, in the treatment of hemorrhage, is how far its diminution or suppression is desirable. When it is situated in a safe place, and at the same time appears to have the effect of relieving some pre-existing morbid affection, more serious than the hemorrhage itself, great caution should be used in employing measures for arresting it. Under such circumstances, it should, in general, be allowed to run its course without interruption. It would be hazardous, for example, to arrest a bleeding from the nose which might appear to be rescuing a patient from apoplexy. Indeed, if the hemorrhage be deficient, it may be desirable somewhat to promote it, and, if prematurely arrested, to favour its return by the application of hot water or hot vapour to the part. Should the bleeding, on the contrary, be in excess, it would be proper to moderate it; and, should it continue after having accomplished the object desired, efforts should be made to arrest it. In all cases, when the hemorrhage is in itself dangerous from its situation, we should endeavour to check it; at the same time employing other measures for obviating any evil which it may have been calculated to remedy. Thus, bleeding from the nose or the rectum may often be left to its course with impunity and even advantage; but from the stomach or lungs, and especially in the closed cavities, should in general be subjected to treatment. On these points much must be left to the judgment and discretion of the practitioner.

Another important consideration is the state both of the part affected, and of the system at large, in relation to their vital force and activity. Remedies to a certain degree opposite are required in the two opposite conditions of exaltation and depression; and the intermediate state, in which neither of these irregularities exists, demands also its own appropriate treatment. The measures to be employed, in any case, divide themselves into such as are appropriate during the continuance of the hemorrhage, and such as are applicable to the interval. I shall treat of these successively.

If the bleeding is moderate, and unconnected with any obvious excitement, either general or local, or with debility, it will usually subside in a short time if the patient and the part affected be kept as much at rest as possible; the body placed in such a position as that gravitation may counteract the flow of blood; the apartment freely supplied with fresh and cool air; cool drinks allowed; everything stimulant, whether in the form of drink or food, forbidden; and the dress or covering so arranged that the patient may be comfortably warm without being heated, and no pressure made upon the veins returning from the vicinity of the hemorrhage.

Should the hemorrhage be attended with moderate arterial excitement, in addition to the measures above enumerated, saline cathartics and refrigerant diaphoretics may be employed with advantage, such as sulphate of magnesia, bitartrate of potassa, the neutral mixture, nitre, and the antimonials.

If evidences exist of considerable plethora or febrile action, with a full, strong pulse, bleeding should be resorted to, and the remedy may be repeated once or oftener, should the same symptoms continue. It is best that the blood should be drawn by a large orifice, so as to make a prompt impression on the system; and the quantity taken should be regulated by the state of the pulse. Where it is of great importance that the hemorrhage should be arrested very promptly, it is generally admissible to push the bleeding until symptoms of faintness appear; as the occurrence of syncope is almost always attended with a cessation of the discharge, which, in many instances, does not return with the returning circulation. In order to obtain this effect without an unnecessary loss of blood, it is sometimes desirable to bleed the patient standing, or, if this be not admissible, in a sitting posture. The effect of the lancet may be materially aided by nauseating doses of tartar emetic or ipecacuanha. Should the pulse remain very frequent after bleeding, with too little force to allow of further depletion, digitalis, or American hellebore, will sometimes be found useful in addition to the other remedies.

When the hemorrhage, either from the amount of effusion, as in some cases of hæmoptysis, or from the peculiarity of its position, as within the cranium, puts life into great and immediate danger, the lancet should be promptly resorted to, even though not apparently called for by the state of the pulse, and should be urged until a decided impression is produced. The danger, in these cases, is not from the loss of blood, but from its effects upon the organs in which it is effused. Thus, in the instance of pulmonary hemorrhage, death may result from suffocation, and in that of cerebral hemorrhage, a fatal apoplexy may occur, unless there be a timely interposition of measures calculated to check the discharge; and nothing is so effectual for this purpose as the faintness produced by bleeding.

While the general measures above mentioned are employed, cold water or ice may be applied as near to the seat of hemorrhage as possible. A powerful hemostatic effect is sometimes produced by the same application made to the arm-pits, between the shoulders, or to the external genitals. The liability, however, of cold, partially applied to the surface, to produce internal inflammation, should be borne in mind; and, in cases of hemorrhage from either of the great cavities, it would perhaps be best to avoid cold water to the exterior of the cavity, unless the loss of blood should be alarming. The local abstraction of blood by leeches or cups is often highly useful, when the hemorrhage is accompanied with symptoms of local irritation or active congestion. Advantage may also be derived from warm pediluvia; and sometimes, when arterial excitement either has not existed or has been subdued, revulsion by means of rubefacients or blisters to the extremities may be resorted to. Sinapisms and blisters in the neighbourhood of the affected part are also sometimes beneficial by removing the remains of irritation, after a sufficient use of general and local bleeding. The tourniquet has been recommended as a derivative measure, and may sometimes prove advantageous as a substitute for depletion, when the propriety of the latter remedy is doubtful.

When hemorrhage is at the beginning without excitement, or when this has been subdued and the hemorrhage continues, recourse may be had to astringent or other hemostatic remedies, which operate upon the capillaries, and either close their bleeding orifices, or in some measure paralyze their circulatory power. If the hemorrhage is very profuse, even though accompanied with general excitement, it may be necessary to resort to some of these remedies immediately; and, under such circumstances, those should be preferred which unite a sedative with their astringent property, as the acetate of lead, or which diminish action in the capillaries without materially affecting the heart, as appears to be the case with ergot. These may be combined, in cases of excitement, with small quantities of ipecacuanha. The particular astringents, which are applicable to particular cases, will be mentioned under the head of the several hemorrhages. It is here sufficient to say that almost all the individuals belonging to the class, whether vegetable or mineral, have been used with more or less advantage. The only hemostatic remedies not belonging to this class, which I deem worthy of notice, are the oil of turpentine and ergot, both of which exert an extraordinary influence, under certain circumstances, in arresting hemorrhage. The former should not be resorted to in cases of excessive action.[*]

In connection with the remedies just mentioned, great benefit will often accrue from the use of opiates, or other narcotic medicines, such as hyoscyamus or conium. As a general rule, these should not be given during the existence of high local vascular irritation or febrile excitement. They are useful by quieting nervous commotion, and thereby equalizing the circulation, and frequently also by relieving those slight irritations of a nervous character, which tend tc sustain the hemorrhage, such as cough in hæmoptysis, and excessive retching in hæmatemesis. Opium is useful also by directing to the surface, and this tendency should be favoured by combining it with ipecacuanha or tartar emetic. Another advantage of this narcotic is that it tends to prevent syncope in cases of exhausting hemorrhage, probably by stimulating the brain. Opium and ipecacuanha may often be happily conjoined with one or more of the astringents, in the same formula.

The late Prof. Chapman spoke very highly of the use of emetics in hemorrhage, unattended with high vascular excitement, or considerable local inflammatory or congestive disorder. (*Am. Journ. of Med. Sci.*, ii. 129.)

In cases to which the internal use of astringents is applicable, the same remedies may often be advantageously applied locally, when the seat of hemorrhage can be reached in this way, as in bleeding from the nose and rectum. Recourse may be had, in some instances, to mechanical compression, with very decisive results, when other measures have failed.

In great danger to life from sudden and profuse hemorrhagic discharges, as from the uterus for example, it is said that the fatal event is sometimes prevented by compression of the humeral and femoral arteries by means of tourniquets, the venous blood being first pressed out of the limbs. The remedy of course acts by concentrating the remaining blood in the vital organs, and thus supporting life until the quantity of the circulating fluid may be sufficiently increased by the natural processes. (*Braithwaite's Retrosp.*, xlviii. 28.)

In the strictly passive hemorrhages, depletory remedies are inadmissible. The astringents and other hemostatics may here be brought into immediate use; while, at the same time, efforts are made to give due tone to the capillaries, to support the actions of the system in general, and to ameliorate the character of the blood, by the use of tonics and stimulants, with a generous diet. The preparations of Peruvian bark, wine, the malt liquors, and animal and farinaceous food of easy digestion, may be employed with greater or less freedom, according to the circumstances of the case. Oil of turpentine is here very often a valuable remedy. When the fault lies exclusively in the blood, as happens in scorbutic cases, attention to the diet is all-important. (See *Scurvy.*) When the hemorrhage is dependent upon relaxation of the vessels connected with an anemic condition of the blood, as appears not unfrequently to happen in bleeding from the uterus, the chalybeates are the proper remedies. Cases in which local irritation is associated with general debility, may often be advantageously treated by tonic and otherwise supporting measures addressed to the system, while the local excitement is counteracted by leeches or cups, cold, and blisters.

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[*] Dr. James Warren has employed for thirty years, with uniform success, a styptic prepared in the following manner. Take of sulphuric acid (by weight) ℥v; oil of turpentine, alcohol, each, f℥ij. Add the oil slowly to the acid, stirring constantly; then add the alcohol in the same manner, stirring till fumes no longer arise; then put the liquid in a bottle with a ground glass stopper. It should be of a dark-red colour, but transparent. The dose is 40 drops, repeated every hour till three or four doses are taken if necessary. Each dose should be mixed with sugar, and taken in a teacupful of water. (*N. Y. Journ. of Med.*, N. S., xii. 299, from *N. Y. Med. Times.*)

In vicarious hemorrhages, as the substitute may be more hazardous than that which it has superseded, it is often advisable to endeavour to restore the original discharge by inviting a flow of blood to the part. This may be done by the use of hot vapour, local warm or hot baths, and various stimulating applications, as alcohol, ammonia, &c. The same rule applies when the hemorrhage has resulted from the suppression of some healthy secretion, as the menses, or the drying up of some habitual discharge, as that from old ulcers, &c. In the latter case, perpetual blisters or issues should be established as near as possible to the original seat of disorder. When it is thought advisable to restrain or altogether arrest an habitual hemorrhage, which has become constitutional, measures should be simultaneously taken to supply the place of the suppressed evacuation by means of purgatives, blisters, issues, setons, &c., or by an occasional bleeding; care being observed to diminish the artificial discharge gradually, so that the vital processes may accommodate themselves to the new condition of things.

The treatment of those hemorrhages which proceed from a strong constitutional, family, or hereditary predisposition, must be conducted upon general principles. Much will depend upon the condition of the blood. If it be rich in red corpuscles, and offer a large and consistent coagulum, and if there be at the same time febrile action and considerable strength of pulse, it may be proper to have recourse to direct depletion, a restricted diet, and the antiphlogistic regimen generally. If, on the contrary, as probably happens in the greater number of instances, the blood be deficient in coagulability, and of the character observed in passive hemorrhage, a diet of animal food, aided by tonics and moderately stimulating drinks, as malt liquor or wine, may become necessary.. In a case recorded by Dr. R. Coates, the hemorrhage, after having resisted a great variety of measures, yielded at last to generous food, stimulants, and laudanum. In the cases of Dr. Otto, *sulphate of soda* appeared to be the only efficient remedy; and Dr. Hay stated that, in a similar family affection under his notice, an ounce of this salt, given daily for several days, generally effected a cure. (*New England Journ.*, ii. 221.) As might have been anticipated, this remedy has not been found to answer equally well in all subsequent cases. It may have acted merely as a purgative; but, more probably, there was some deficiency in the blood which it served to supply; and, as the condition of that fluid is not alike in all cases, the same remedy cannot be expected to succeed in all. It may be well to bear in mind, in the treatment of this variety of hemorrhage, the measures recommended by Dr. John Chapman to regulate the sympathetic centres; the application, namely, of ice to the spine when congestion may be supposed to exist in these centres, and of hot water when they may be supposed to require stimulation.

The treatment adapted to the interval of the attacks of hemorrhage remains to be considered. Here also it is necessary to refer to the state of the system. In active hemorrhage, it is important to regulate the diet so as to obviate plethora and vascular excitement. But it is also important not to carry a system of reduction so far as to produce debility; for this rather favours than prevents those irregularities in the circulation which lead to congestion and consequent hemorrhage. The quantity of food, and its quality in relation to nutritive and stimulating power, should be somewhat under the standard adapted to the state of health. If the tendency to the accumulation of blood, and to an excess of the red corpuscles be strong, the patient should be confined to vegetable food and milk, until that tendency has been corrected. In cases of a less decided character, a small proportion of the lighter meats may be allowed; and, where there is any doubt upon the subject, the trial should be made first with boiled meats, as less stimulating than those prepared in other modes. Exercise also is important, in order to maintain an equable vigour in the various functions, and thus obviate local determinations. Passive exercise, as in riding, driving, and sailing, is preferable to active, because less calculated to call particular organs into excessive action. All excitements, physical or mental, should be scrupulously avoided. Great bodily exertion of any kind, as running, leaping, wrestling, lifting weights, straining, ascending heights, &c., may provoke a return of the hemorrhage; and fits of anger, or any other strong emotion, are scarcely less injurious. To maintain a gentle exercise of all the bodily functions, and an equable temper of mind, should be the constant aim of the patient. All artificial causes of an unequal distribution of the blood should be avoided. Hence, care should be taken that no part of the clothing be so tight as to interfere with the circulation, and that the body be not kept long in a position which might cause the blood to gravitate towards the organ affected. The excitant effect of excessive heat, and particularly its partial application, should be guarded against; and not less so, any exposure to cold which might tend to produce congestion or inflammation. For the same reason, constipation of the bowels should be carefully obviated. Indeed, when the plethora and tendency to local congestion are strong, a dose of one of the saline purgatives, once or twice a week, will not be found amiss. Steady revulsion towards some portion of the body, distant from the part affected, is one of the most efficient prophylactics. Hence the utility of a perpetual blister, a seton, or an issue upon the arm or thigh. If at any time there be threatening symptoms of an attack, they should be met by saline cathartics, a very low diet, rest, and even the abstraction of blood. It has been recommended to apply cold water occasionally to the former seat of hemorrhage; but this practice is somewhat hazardous; as, unless the cold be perseveringly maintained, there might be a risk of reaction upon its removal; and if continually applied, it would endanger internal irritation or inflammation.

In the passive form of hemorrhage, the great object of the practitioner, in the intervals, should be to restore vigour to the functions without over-exciting them, and a healthy constitution to the blood. This is to be effected by a nutritious diet, fresh air, passive exercise, and agreeable mental occupation, assisted occasionally by tonic medicines, especially the simple bitters, quinia, and the preparations of iron.

In either form, should the hemorrhage return periodically, at short intervals, much might be expected from the use of sulphate of quinia, and, if this should be inapplicable, from the arsenical medicines.

In all cases, the practitioner should thoroughly investigate the condition of the system, to ascertain whether there may not be some concealed source of the hemorrhage in organic derangements, and, if successful in his search, should direct his remedies towards the removal of these causes.

In treating of individual hemorrhages, our attention will be directed first to those of the mucous membranes, which are infinitely the most frequent and important; including indeed all which are generally treated of in nosological arrangements. Those which occur in the other tissues will afterwards be briefly noticed.

Article II.

HEMORRHAGE FROM THE NOSTRILS, OR EPISTAXIS.

THE mucous membrane of the nostrils is probably the most frequent seat of hemorrhage. The affection in this situation is liable to all the diversities which have been enumerated in our general remarks upon the subject. To treat of them here would be mere repetition.

Symptoms, Course, &c.—When the hemorrhage is of the active kind, it is often preceded by signs of local disorder; as a feeling of fulness, heat, itching, &c. in the nostrils, weight, tension, and pain in the forehead, giddiness, general headache, buzzing in the ears, dizziness, disordered vision, redness of the eyes and nostrils, flushing of the face, and coldness of the hands and feet. All these symptoms are not usually present in the same case, nor in equal degree in different cases. Sometimes nothing more is felt than a fulness or sense of weight about the head or nostrils; and frequently the eruption of blood is preceded by no observable disorder. The blood is usually florid and coagulable, forming a large clot, which is little disposed to part with its serum. It issues, in most cases, from one nostril only, but sometimes from both. It may fall drop by drop, or in a continuous stream, and varies from a few drops to a quantity sufficient to endanger life. Occasionally it flows posteriorly as well as anteriorly, and then escapes by the mouth. It may even take this direction exclusively. When the hemorrhage is considerable, portions of the blood are often swallowed, so as even to occasion nausea and vomiting. Small portions, too, sometimes pass into the glottis, and produce coughing. Fears of the existence of hæmatemesis or hæmoptysis may thus arise; but, when the blood flows also from the anterior nostrils, there can be little difficulty in forming a correct diagnosis. There may be some obscurity when the hemorrhage occurs during sleep, and takes a direction exclusively backwards. The patient, awaking, vomits or coughs up blood, and becomes much alarmed. A close examination, however, will generally detect traces of epistaxis. Blood, for example, will be brought away by blowing the nose, or clearing out the posterior nares; and its fresh character will show that it had not been lodged there in vomiting. Should there, then, be no return of the discharge from the stomach or lungs, the fears of the patient may be confidently quieted.

Epistaxis is very irregular in its occurrence, duration, and progress. It comes on at uncertain times, lasts from a few minutes to many hours, sometimes even a day or more, and is very frequently suspended, to recur again at short intervals, occasionally from some slight cause, occasionally without any observable cause whatever. It is very seldom dangerous, and often, indeed, proves salutary by relieving pre-existing disorders, especially those attended with a strong determination of blood to the brain. It is sometimes, however, in such excess as to justify alarm, and has been known to prove fatal, though no instance of this kind has fallen under the notice of the author. The most profuse, and most dangerous form of epistaxis, is that in which the hemorrhage is of a strictly passive character. Great quantities of blood are sometimes lost in such cases, and the suppression of the hemorrhage is often difficult. This form of the affection is the more dangerous, as it generally attends diseases of a prostrate character, which can ill bear the loss of blood. It is probable that most of the fatal cases have been thus complicated, and that death has resulted much more from the pre-existing disease than from the hemorrhage, though perhaps hastened by this cause.

Causes.—Where no predisposition to epistaxis exists, it is seldom produced except by direct violence; but, with such a predisposition, very slight causes are sufficient to induce an attack. A moderate blow upon the nose, picking the nostrils, sneezing, a violent paroxysm of coughing, a sudden jar of the body, strong muscular efforts of any kind, stooping, tight cravats, exposing the head to the fire or the sun, sudden changes in the temperature of the body, the introduction of irritating powders or vapours into the nostrils, stimulating food or drink, paroxysms of anger or other strong emotion, and, in general, any other agency capable of producing a rush of blood to the head, or of impeding its return through the veins, may serve as causes of this hemorrhage.

The predisposition consists either in the state of the mucous membrane, in that of the system, or in the two combined. In those subject to the affection, a swollen and peculiarly tender state of the Schneiderian membrane has sometimes been observed. The hemorrhage is an occasional attendant upon common colds or coryza, and is a not unfrequent result of the apoplectic tendency. It often accompanies polypus and other organic diseases of the nostrils. A plethoric state of system, an excited state of the circulation, and a hemorrhagic constitution of the blood predispose to it. The predisposition is occasionally so strong as to lead to the result without any exciting cause. It exists to this degree in various febrile and inflammatory complaints, in which bleeding of the nose is a common occurrence, especially in typhoid fever. Phthisis in its advanced stages, congestion and organic disease of the liver, malignant exanthemata, typhus fever, scurvy, and purpura are also among the complaints often attended with epistaxis, which in these affections is usually passive. The scrofulous or tuberculous state of system constitutes a predisposition to it. The affection occasionally follows suppression of the menses, of the hemorrhoidal flux, and of other natural or habitual discharges. I have known it apparently the result of pregnancy. The time of life appears to have some influence in forming the predisposition; for the complaint is very common about the age of puberty, though it may occur at any period from childhood to old age. Very often, however, a strong predisposition exists which can be traced to no known cause. The general hemorrhagic tendency is apt to show itself in the form of epistaxis.

Treatment.—In relation to the propriety of attempting to suppress this hemorrhage, in any particular case, the remarks already made upon hemorrhage in general are applicable. When no constitutional symptoms exist which it may be calculated to relieve; when there is no increased energy of the circulation, plethora, or uneasiness about the head; and when the hemorrhage is not vicarious to some more hazardous discharge, endeavours should be used to check it, if it do not soon cease spontaneously; and, even in cases which offer the objections above alluded to, if it continue after the relief of the symptoms, or be so copious as to endanger life, it should be arrested. In the passive form, it should be suppressed as soon as possible; as, in this state, instead of relieving the disease, it tends to aggravate the debility in which it originated.

The patient should be placed in a sitting posture, in a chair or in bed, with his head erect, or slightly inclined backward. The air of the chamber should be cool and fresh. The cravat, or anything acting in the form of a ligature about the neck, should be removed. Cold water, ice, or snow, should be applied to the outside of the nose, the head, or the back of the neck. Dipping the head in cold water, or holding it under a pump, sometimes causes an immediate cessation of the hemorrhage. Immersion of the arms in cold water, and the application of cold to the arm-pits, groins, or other very sensitive part, have also been recommended. Should these measures fail, recourse should be had to astringent injections. The author usually employs a strong solution of alum, in the proportion of fifteen or twenty grains, or even more, to the fluidounce, with almost uniform success. Kino, catechu, or extract of

excitement should be directed towards the extremities by immersing the hands and feet in hot water. When the hemorrhage is very copious, it has been recommended to apply ice or cold water to the epigastrium.

If there should be much nausea, retching, and ineffectual effort to vomit, with the discharge of a little coagulated blood, giving rise to the suspicion that much more blood might be remaining in the stomach, and serving as a source of irritation, it might be proper to effect its complete evacuation by a moderate dose of ipecacuanha. The action of the medicine would be less likely to provoke hemorrhage than the spontaneous movements alluded to, and after its operation the stomach would probably be left comparatively quiet. But, under ordinary circumstances, emetics are of doubtful propriety.

Should the pulse be excited, and of sufficient strength, and especially if, at the same time, there be symptoms of gastric inflammation or vascular irritation, blood should be taken from the arm, in quantities proportioned to the effect of the operation upon the pulse; and a continuance of the same circumstances would justify a repetition of the measure. Sometimes, when the patient is too feeble to admit of bleeding, and the local symptoms alluded to exist, leeches to the epigastrium may be substituted; and these will often be found useful auxiliaries to the lancet. The system, however, is often too much exhausted to admit of depletion in any shape. Sinapisms and blisters to the epigastrium may then be used.

When the patient is very prostrate, with a pale and cold skin, and a feeble or absent pulse, much advantage may sometimes accrue from the hot bath, of the temperature of about 105°, by which the blood is drawn to the surface, and a safe stimulus applied to the system. The same remedy may also be used in less prostrate conditions, in the more advanced stages of the disease, when it is deemed highly advisable to give a centrifugal direction to the blood.

Acetate of lead, in small and frequently repeated doses, combined with a little opium, is one of the most efficient internal remedies. If this should be rejected, or should fail from other causes, recourse may be had to other astringents, such as alum, kino, catechu, krameria, aromatic sulphuric acid, and some of the liquid preparations of iron. But these are incompatible with much irritation, and with acute inflammation of the stomach. In the advanced stages, and in cases of little or no local excitement at the commencement, oil of turpentine, or creasote, with or without laudanum, may be given in small doses. The former is peculiarly adapted to the hemorrhage which sometimes occurs in the last stage of gastric inflammation. Ergot might be tried with some hope of advantage; but it occasionally nauseates, and the author has not employed it in this hemorrhage.

Excessive irritability of the stomach should be allayed by lime-water and milk, if not incompatible with the case, by injections of laudanum, and by a sinapism or blister over the stomach. The bowels should be kept open, when the stomach is irritable, by enemata; when it is retentive, by mild cathartics, as the Seidlitz powders, magnesia, sulphate of magnesia, castor oil, &c. Sometimes active purgation is indicated, especially in congestion of the portal circle, and then infusion of senna with Epsom salt may be used.

When the liver is in fault, the hepatic secretion should be promoted by minute and frequently repeated doses of calomel or mercurial pill, alternated with mild cathartics; and this plan should be pursued until the stools exhibit yellow bile, or the gums of the patient are touched. In some cases, it is possible that a purgative dose of calomel would act more efficiently; but in general the alterative plan is preferable as the safer. Both in hepatic and splenic cases, remedies should be employed calculated to relieve the disease of these organs respectively. In splenic cases, advantage will often accrue from the combined use of iron, quinia, and purgation.

sion, if properly applied, can scarcely fail to arrest the hemorrhage. For this purpose, a piece of soft sponge or patent lint of a cylindrical shape, and saturated with some astringent solution, should be carefully introduced into the nostril, so as if possible to come in contact with the bleeding surface. Perhaps small pledgets of raw cotton, successively and carefully introduced by a probe, would be still more effectual. Abernethy never failed of success, by winding a piece of moistened lint around a probe, so as to form a cylindrical plug, passing this along the floor of the nose for its whole length, then carefully withdrawing the probe, and allowing the lint to remain for three or four days. (*Tweedie's Syst. of Pract. Med.*, article *Epistaxis.*) Another plan is to introduce a portion of hog's intestine, properly prepared and closed at one end, deeply into the nostril, then to inject some cold water forcibly, and tie the other extremity of the tube. But should the blood, notwithstanding these measures, continue to flow through the posterior nares into the throat, efforts must be made to close both extremities of the nasal cavity. This is to be done by passing through the nostril, in a canula, a double piece of cat-gut, thin wire, or other stiff ligature, somewhat bent at its looped extremity, so that the end, when advanced beyond the canula, may have a tendency downward; pushing the ligature till, having passed beyond the velum pendulum, it may be seized by the finger or a suitable instrument in the throat; then drawing it forward through the mouth, attaching to it firmly a suitable piece of sponge or lint, and, by means of the string in the nose, drawing the plug somewhat firmly into the posterior nostril. Another string should be attached to the plug and left hanging out of the mouth, so as to enable the practitioner to remove the foreign body when desirable. The anterior nostril should, at the same time, be closed by a piece of sponge or lint introduced by a probe. This operation, however, is of difficult performance; always produces a great deal of irritation in the throat, with irresistible convulsive movements, as in vomiting; and is very seldom necessary. Abernethy never had occasion to resort to it.

For the constitutional measures requisite to prevent a return of epistaxis when arrested, the reader is referred to the general remarks on hemorrhage. Should the predisposition to the affection consist in an irritable state of the nasal membrane, it is recommended to protect it by the daily application of some simple ointment; and, when the membrane is chronically inflamed, leeches externally, and injections calculated to correct this morbid condition, as solutions of acetate of lead and sulphate of zinc, may be found useful as prophylactics.

Article III.

HEMORRHAGE FROM THE MOUTH, OR STOMATORRHAGIA.

THE mucous membrane of the mouth is much less liable to hemorrhage than that of the nostrils; but cases of stomatorrhagia now and then occur; and the affection requires a brief notice. In the mouth may be here included, for convenience sake, all the parts visible from without; the gums, tongue, cheeks, fauces, and even the posterior and upper portion of the pharynx. Hemorrhage may occur from any portion of this surface, but is most frequent from the gums.

The symptoms are too obvious to require enumeration. When moderate in quantity, the blood is discharged by spitting; when very profuse, it runs in a stream from the mouth. In general, there is very little difficulty in the diagnosis. Not unfrequently, if the mouth is washed out with water, the point or surface from which the blood proceeds may be seen. It may happen, in some instances of very copious hemorrhage, particularly in the fauces, that the effused

excitement should be directed towards the extremities by immersing the hands and feet in hot water. When the hemorrhage is very copious, it has been recommended to apply ice or cold water to the epigastrium.

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brought in contact with the bleeding surface. In the case of hemorrhage from the roof of the mouth above alluded to, kino applied thickly upon a piece of patent lint, and pressed upwards by the tongue, arrested the discharge. Solution of subsulphate of iron (U. S. Ph.) is an admirable styptic, where it can be applied, by means of a hair-pencil, to the bleeding point. When the blood issues from the socket of an extracted tooth, the same remedies will often answer. If not, the cavity may be filled with wax, or lint, or a piece of sponge saturated with the astringent; and pressure may be made by means of a cork, fitted to the cavity, and held in its place by confining the jaws with a bandage. Dr. Physick used to recommend, in hemorrhage of the mouth from wounds, that the mouth should be kept open by means of a piece of wood or other firm substance between the teeth, having often found this remedy to answer after operations. (R. Coates, *N. Am. Med. and Surg. Journ.*, vi. 43.) In bleeding from the divided frænum, if other means fail, it may be necessary to employ the actual cautery. When bleeding from the mouth is vicarious to the menses, efforts should be made to restore the function to its healthy state; when dependent upon morbid states of the blood, these must be corrected.

Article IV.

HEMORRHAGE FROM THE LUNGS, OR HÆMOPTYSIS.

Syn.—*Spitting of Blood.*

THE term hæmoptysis, though, from its origin (*αἷμα*, blood, and πτυω, I spit), applicable to any case in which blood escapes through the mouth, is now universally restricted to hemorrhage from the lungs, and their appendages, the trachea and larynx. The blood may proceed either from the mucous membrane of the air-passages, including the larynx, trachea, and bronchial tubes, or from the air-cells of the lungs. Another form of hemorrhage which may come under this head, though not always attended with discharge of blood from the mouth, consists of bleeding into the pulmonary parenchyma or interlobular tissue, and is named apoplexy of the lungs.

Symptoms, Course, &c.—The first feeling of the patient is, not unfrequently, a tickling or other unusual sensation in the trachea or larynx, which induces a slight cough, followed by the expectoration of blood. A return of the sensation leads to a more or less frequent repetition of the same effort, producing a greater or less discharge, until the hemorrhage ceases. More frequently, however, there are various preliminary symptoms, such as sensations of fulness, weight, tightness, heat, soreness, and oppression over the whole chest, or in some particular region of it, often attended with an excited pulse, flushed cheeks, and headache, and occasionally with cool extremities, general rigors, and decided febrile symptoms. In many instances, moreover, a dry cough precedes for some time the expectoration of blood. These symptoms of local and general excitement mostly continue, for a longer or shorter time, after the commencement of the hemorrhage, by which, however, they are usually at length relieved.

The appearance of the blood discharged differs according to its precise origin, quantity, length of detention, &c. It is usually liquid, florid, and more or less frothy, owing to the admixture of air in the respiratory passages. When the quantity is very great, it is less frothy, though a portion ill generally be observed in this state, upon the surface of the expecto- lood in the vessel which receives it. Occasionally it is partially coag- especially when small in quantity, and detained for some time in the bronchia. In such instances, it is little if at all mixed with bubbles of air. When it has been long detained in the air-passages, it is of a dark colour; and this appearance, following the arterial redness which generally characterizes the freshly discharged blood, indicates a moderation or cessation of the hemorrhage. The blood is also frequently mixed with mucus. It may have this character throughout the attack, when the hemorrhage is slight, but, in the much greater number of cases, the phenomenon is confined to the latter stages, when the bloody transudation has begun to give way to mucous secretion; and the proportion of blood gradually diminishes until the expectorated matter is entirely free from it. There is a difference in the mode of admixture. Sometimes the blood appears in the form of distinct streaks in the mucus, indicating an origin of the two liquids from different, and possibly distant points. In other cases, the blood and mucus are intimately blended, giving a rusty hue to the expectoration, which gradually becomes lighter as the quantity of the former fluid diminishes, until an opaque whitish or yellowish puruloid matter is left. In such cases, the two fluids have probably issued from the same portion of membrane, and that, in a state of high irritation or positive inflammation. Occasionally the blood is mixed with a tenacious fibrinous matter, as in pneumonia. This would appear to indicate an inflammatory origin in the air-cells, or minute bronchial tubes. Important inferences may thus be drawn from the appearance of the discharged blood.

The quantity of blood varies, from enough merely to tinge the expectoration, up to several pints. In the great majority of cases the loss is moderate, and of itself wholly insufficient to produce any serious impression on the system. In some instances it is directly fatal, though very rarely so.

The presence of the effused blood in the lungs, when considerable in quantity, produces more or less difficulty of respiration, with wheezing, and sometimes a gurgling or rattling sound, from the passage of the air through it, both during inspiration and expiration. The dyspnœa is occasionally very great, being attended with heaving of the chest, a sense of fulness and great oppression, and marks in the countenance of imperfect respiration. The cough which attends the hemorrhage varies according to circumstances. Sometimes it depends wholly upon the presence of the effused blood; but more frequently it originates also in a tuberculous or inflammatory state of the lungs, and then tends to sustain and aggravate the hemorrhage. The cough which is provoked by the effused blood varies with the quantity and seat of the effusion. When the blood is pure and in the larger bronchia, it is usually evacuated without much effort; but, when in the air-cells or minute bronchial ramifications, or mingled with tenacious secretions, or allowed to remain until it has coagulated, it provokes full, deep, and often hard and painful coughing. In rare instances, the gush of blood into the air-passages is so sudden and copious as to produce a feeling of impending suffocation, and to give rise to convulsive efforts of the muscles of expiration for its discharge. It is thus thrown forcibly into the fauces, and escapes not unfrequently both by the mouth and nostrils, occasioning, at the same time, probably by its presence in the throat, spasmodic contractions of the muscles concerned in vomiting. The contents of the stomach are thus mingled with the blood from the lungs; and, at first sight, the case may bear a close resemblance to hæmatemesis. But the symptoms of disturbed respiration, and the evidences presented by auscultation, will be sufficient to indicate its true nature.

Along with the phenomena already mentioned, there are often present, especially upon the first attack of hæmoptysis, various symptoms ascribable to the very natural alarm of the patient; as great paleness, anxiety of countenance, a quickened and agitated but feeble pulse, tremblings, faintness, and even nausea. These have fortunately, in many instances, a tendency to diminish the hemorrhage. In the subsequent attacks, the patient in general feels less apprehension; but the idea of great danger, connected with spitting of blood, is so firmly fixed in the public mind that few are found capable of resisting the impression entirely. When the loss of blood is great, the effects of this are added to those of alarm, and symptoms of great prostration are occasionally presented. It is usually, however, more from the long continuance than from the great copiousness of the hemorrhage, that the debilitating consequences of loss of blood are experienced in any great degree. Like any other hemorrhage, that from the lungs may be of a purely passive character, though this form of the disease is comparatively rare.

The course of hæmoptysis varies as much as the symptoms already enumerated. Sometimes the whole attack is limited to a few acts of expectoration, slight or copious as the case may be, and no return is experienced on the particular occasion. Sometimes the discharge is suspended during a longer or shorter interval, for example, a few hours, a day, or more than a day, and then recurs, to cease again, and again recur; and the affection may thus continue irregularly, sometimes better and sometimes worse, for weeks and even months. In other cases, again, it is continuous for many days, with little or no interruption, except that occasioned by the slow accumulation of the extravasated blood. It rarely happens that an individual, if he lives many years after the first attack, escapes a return; and, in many cases, the returns are frequent. In these cases, the patient, in general, dies ultimately of pulmonary consumption. In some instances, the attacks are periodical, occurring especially once a month. This is apt to be the case in women with amenorrhœa; and the same monthly returns are said occasionally to have been observed in men, as vicarious to a suppressed hemorrhage from the rectum. Such cases are not usually attended with much danger.

Hæmoptysis is very seldom directly fatal. The instances of death from this cause, without organic disease of the lungs or great blood-vessels, are exceedingly rare. One is recorded by Andral, in which the patient died from the mere transudation of blood from the bronchial vessels, without ulceration, rupture, or any other discoverable cause of hemorrhage. Death may result in two different modes. The quantity of blood may be so great, and its effusion so sudden, that it cannot be discharged, and the patient must, therefore, die of suffocation; or the loss of blood from the circulation may occasion a fatal syncope. It is probable that sudden death results usually from the former cause. In some instances, the patient is exhausted by a long-continued discharge. Generally speaking, however, when a patient dies with pulmonary hemorrhage, it is through some coexisting disease, especially of the lungs, heart, or aorta.

It is often desirable to know from what part the blood proceeds. It may be suspected to come directly from the mucous membrane of the *larynx*, especially from the neighbourhood of the glottis, when the preliminary symptoms of irritation exist in this part, and are wanting in the lungs; when the exciting cause was one peculiarly calculated to act upon the glottis, as loud speaking, or singing; when no proofs are afforded by auscultation of effusion in the bronchial tubes; in fine, when the blood is in small quantity, little mixed with air, and discharged by that peculiar cough by which irritating substances are removed from the glottis, and which may very properly be called laryngeal. Hemorrhage from this vicinity may result from simple irritation of the organ, aided by a hemorrhagic diathesis; but it is probably, in the greater number of cases, dependent upon ulceration of a scrofulous character, and associated with tubercles in the lungs.

The same absence of pulmonary symptoms, the same character of the cause, and similar appearance of the blood discharged, with a cough neither laryngeal, nor apparently connected with the lungs, and the localization of the paminary sensations of uneasiness in the trachea, would fix attention upon this ortion of the air-passages as the seat of the disorder. But hemorrhage selom takes place from the trachea.

The symptoms which point to the bronchial tubes, as the source of the hemorrhage, have been already sufficiently described. All cases in which there is o particular reason for referring it to some other seat, may be considered as ronchial. They are beyond all comparison the most numerous. In addition o what has been stated, it is only necessary to mention that, in these cases, he sounds produced by liquid in the bronchia will be discovered in the chest y auscultation.

It has been mentioned that blood is sometimes effused in the air-cells, and he interlobular areolar tissue, constituting what Laennec has called *apoplexy f the lungs*. This is not always attended with the escape of blood from the outh; and, in such cases, an accurate diagnosis is very difficult, and perhaps mpossible. When there is a considerable reddish and very frothy expectoraon, with great oppression of breathing, and a sense of impending suffocation, nd when, at the same time, an absence of respiration in a certain portion of he lung is indicated by auscultation and percussion, with a subcrepitant, or ubmucous rale in the vicinity of the dulness, and a coarse mucous rale in the rge tubes, there is reason to suppose that the hemorrhage may be of the kind lluded to; though it must be confessed, that the inference is not necessarily orrect. These cases are always alarming and dangerous, but by no means inevitably fatal. The effused blood, when not of great extent, is surrounded in me, after the cessation of the hemorrhage, by a sort of cyst similar to that ormed in cerebral apoplexy, which probably serves not only to isolate the matter thus become foreign to the system, and consequently irritant, but to effect s ultimate absorption.

Diagnosis.—Hemorrhage from the mouth, fauces, and posterior nares is ometimes mistaken for hæmoptysis, to the great alarm of the patient. In ordinary cases, there can be no difficulty in the diagnosis. In some instances, owever, the nature of the case is not so clear. Thus, in epistaxis, when the lood escapes exclusively by the posterior opening of the nostrils, and through he mouth, if the quantity is considerable, portions are apt to fall upon the lottis, excite coughing, and thus seem as if they came from the air-passages. ven when the hemorrhage is slight, if it occurs during sleep, the same result ften happens, and the patient, on awaking, supposes that he is coughing up lood. The physician may also be deceived, unless he carefully examine into he case. It generally happens that, upon close inspection, blood may be observed at the anterior opening of the nostrils, or, at least, may be made to appear there, if the patient be directed to blow the nose smartly. The blood ischarged is not mixed with air, and is without that semi-coagulated consistence, and somewhat regular form, that often belong to the sputa in hæmoptysis, when not frothy. When the hemorrhage is slight, coagulated blood may ften be seen in the fauces, hanging over the velum, upon which it rests. After he suspension of the bleeding, coughing brings up no more blood, while if the atient clear out the nostrils posteriorly by drawing air suddenly through the ose, either blood, or mucus mixed with blood, is discharged through the mouth. When the hemorrhage is from the mouth or fauces, a close inspection will often iscover the precise source. The diagnosis is here also aided by the appearance of the blood, which resembles that from the nostrils. In both cases, the ymptoms of effusion into the bronchial tubes, whether of a general nature, or hose revealed by auscultation, are wanting; though there might be some difficulty in this respect, if the hemorrhage should be complicated with catarrh. n some rare instances of hæmoptysis, the blood escapes by the nostrils as well s the mouth, and there might be risk of mistaking the case for one of epistaxis. But here the pectoral signs would probably be abundant; as the quantity of blood effused must be considerable, to be attended with such a phenomenon. The diagnostic signs between hæmoptysis and hæmatemesis will be given in the account of the latter hemorrhage.

Anatomical Characters.—In most cases, no other phenomenon is presented by the mucous membrane from which the hemorrhage proceeded than a certain degree of redness, and occasionally of inflammation; and sometimes even these are wanting. The most careful search generally fails to detect any rupture, ulceration, or other solution of continuity. The inference is, that the blood has escaped by transudation from the vessels. But it is possible that morbid openings may exist, large enough to admit the issue of blood, yet so minute as to escape the strictest scrutiny; and I am disposed to think that an absolute rupture may take place more frequently than some pathologists have been willing to allow. When the discharge comes on very suddenly, and in considerable quantities, there is reason to believe that it takes place through a solution of continuity in a vessel; for transudation, whether as a healthy or morbid process, is almost always somewhat gradual at the commencement.

When the effusion of blood has taken place into the pulmonary parenchyma, constituting *apoplexy of the lungs*, a circumscribed solid portion is observed, of greater or less extent, from one to many cubic inches, which, upon being cut, exhibits a deep reddish-black colour, and a somewhat granular structure. There appear to be two pathological conditions which have been confounded under this name. In one, the effused blood is contained in the air-cells, and smaller bronchial tubes, completely blocking them up; but without any rupture of the cellular tissue, or vascular coats. In this case, when the cut surface of the solidified mass is scraped by the scalpel, small isolated portions of coagulated blood are removed, and the tissue of the cells is exposed. In the second of the conditions alluded to, the tissue is ruptured to a greater or less extent, blood has escaped into the interlobular structure, and sometimes clots are found, as in cerebral apoplexy, contained in cavities hollowed out in the substance of the lungs. Andral considers these to be cases of true pulmonary apoplexy. The extent of the effusion is in some instances very great, involving even one or more lobes; and the blood sometimes lacerates the pleura also, and escapes into the cavity of that membrane. A third condition, which might be confounded with effusion into the air-cells, is that in which the blood has issued from the bronchial mucous membrane, and gravitated, or been forced by inspiration, into the cells of a certain portion of the lungs, so as to fill them up completely, as well as the minute ramifications of the bronchia. That such an event occasionally happens, may be inferred from the observations of Andral (*Anat. Pathol.*, iii. 488), and those of Dr. Watson (*Med. Gaz.*, ix. 656). But Dr. Burrows states that, though his field of observation in relation to the pathology of the lungs has been very extensive, he has never met with an instance in which the blood has not appeared to be coagulated in the position in which it had been extravasated. (*Tweedie's Syst. of Pract. Med.*, article *Hemorrhage from the Lungs.*)

Causes, &c.—The causes of pulmonary hemorrhage are blows or other forms of external violence; the severe exertion of the lungs in speaking, hallooing, singing, coughing, sneezing, laughing, or playing on wind instruments; straining at stool or urine, or in the lifting of weights, wrestling, &c.; other forms of violent muscular exertion, as running, leaping, ascending heights, &c.; a sudden diminution of the atmospheric pressure, whether upon the surface of the earth or at great elevations; the inhalation of irritating gases or powders, or of hot or very cold air; tight lacing and other artificial methods of compressing the chest or abdomen; whatever conditions of health or disease have a tendency to diminish the capacity of the lungs and thereby expose the pulmonary vessels to distension, and whatever block up the abdomen so as to throw the blood especially upon the chest, as pregnancy, ascites, and large abdominal tumours; the transfer of gouty or rheumatic irritation to the lungs; the suppression of habitual discharges, whether healthy or morbid; vicissitudes of temperature; organic diseases of the lungs and heart, producing either irritation, inflammation, ulceration, or mechanical congestion of the bronchial membrane; a relaxation of the pulmonary tissue consequent upon great debility; and, finally, a morbid state of the circulation, in relation either to the force of movement, or the quantity or quality of the blood. Some of these causes are only exciting or occasional, others are both exciting and predisposing, according to the circumstances of their action. Whatever is common to them, as causes of hemorrhage in general, has already been sufficiently discussed. Age has great influence as a predisposing cause. By far the larger proportion of cases of hæmoptysis occur between puberty and full maturity, or from fifteen to thirty-five. The disease, however, is not uncommon in middle and old age. It is rare in infancy.

Hæmoptysis may be associated with all the different pathological states which have been enumerated under the head of hemorrhage in general, and which it is unnecessary to repeat in this place. But there are certain morbid affections which are especially productive of this hemorrhage, and therefore require a particular notice. Those which merit attention may be included under the heads of 1. bronchial or pulmonary inflammation; 2. phthisis; 3. organic diseases of the heart; 4. aneurism; and 5. suppression of habitual discharges, whether healthy or morbid.

With Inflammation.—Whether irritation is to end in hemorrhage, or to advance to inflammation, depends frequently upon an unappreciable condition of the part affected, or of the system. It is highly probable that the hemorrhagic constitution of the blood sometimes leads to the former instead of the latter result. Now it may readily happen that the scale may be very nicely balanced between these two affections; that the tendency to neither exclusively may be very decided; and that consequently an irritation may first exhibit itself in the extravasation of blood, and, if not relieved in this way, may end in inflammation. Hence bronchitis and pneumonia may be ushered in by an attack of hæmoptysis. The case appears at first to be only an ordinary one of active hemorrhage; the symptoms of decided inflammation being subsequently developed. But, even after inflammation has been established, more or less blood is often extravasated, and escapes by expectoration. The quantity, however, is now usually small, and generally mixed with mucus. In pneumonia, bloody expectoration is so frequent as to be looked upon almost in the light of a characteristic symptom. Though, in most cases, the sputa are merely tinged so as to give them a rusty hue, yet it sometimes happens that pure blood is discharged. This occurs especially in pneumonia with a typhoid tendency; and, in bad cases of this kind, considerable quantities of dark blood are occasionally coughed up. A hemorrhagic character of the mass of the blood is here probably associated with the causes of inflammation. One of the effects of inflammation is to soften the tissue which it affects. There is reason to believe that blood-vessels, whose power of resistance has been thus diminished, sometimes yield to the *vis a tergo*, and that hemorrhage ensues from their rupture. Another mode by which inflammation occasionally gives rise to hemorrhage is through ulceration. Hæmoptysis, however, from this cause is rare. A case is recorded by Dr. Carswell, in which ulceration, perforating one of the bronchia, opened a branch of the pulmonary artery, with a speedily fatal effect.

With Phthisis.—This is by far the most frequent complication of hæmoptysis. Bleeding from the lungs has been so frequently followed by pulmolieving the congestion of the stomach, and thus preventing more injurious results in that organ, partly by exhausting the sources of the disease in one or both of the viscera referred to. It is a recorded fact, that very large swellings of the spleen have been suddenly reduced by the occurrence of hemorrhage from the stomach.

4. *Other Organic Affections.*—Solid tumours within the abdomen, whether scirrhous or not, large aneurisms, and even the pregnant uterus, may act as causes of hæmatemesis by pressure upon the veins which return the blood of the portal circle, or upon the great descending trunk of the aorta or the primitive iliacs. Organic disease of the heart may have the same effect by impeding the return of the blood through the vena cava, and thus producing general venous congestion. Another origin of gastric hemorrhage may be the bursting of an aneurism into the stomach. A case is recorded by Dr. G. B. Hodgkin, of Media, Pa., in which repeated attacks of hæmatemesis, which ultimately proved fatal, proceeded from a tumour in the stomach, at the cardiac orifice, consisting of a congeries of varicose veins, which were all traced into the gastric vein, and which appeared to open by minute orifices into the stomach. (*Am. Journ. of Med. Sci..*, Oct. 1856, p. 376.)

Hæmatemesis is not a very uncommon affection in females, as the result of suppression of the menses; and it is then, as before stated, apt to assume a periodical form. It is liable especially to occur in nervous females; but perhaps this association is merely accidental; the nervous symptoms being a mere dependence of the uterine affection, without any direct relation to the hemorrhage from the stomach. It is, however, peculiarly apt to be excited in such patients by causes calculated to disturb their equanimity.

This hemorrhage is also an occasional attendant upon malignant fevers, scurvy, purpura hæmorrhagica, and other affections in which the blood has assumed the hemorrhagic character. In these cases, it is generally associated with hemorrhage from other sources, and is passive in its nature.

As in all the other hemorrhages, the blood in hæmatemesis may escape through a wound or rupture of the vessel, through an opening produced by ulceration or sphacelus, or through the coats without any discoverable solution of continuity; and, in the last-mentioned case, it may be active or passive, the result, namely, either of increased vascular action, or of a mere relaxation of the walls, allowing the blood to pass without the usual resistance. How the blood may be conceived to pass through the vascular coats, without a rupture, has been explained in the general observations on hemorrhage.

Anatomical Characters.—If the hemorrhage has proceeded from a wound or rupture of a vessel, the orifice may generally be found upon close inspection. A case is recorded in which it resulted from the bite of a leech swallowed with the water of a rivulet. (*Dict. de Méd.*, xii. 330.) In many cases, the most careful examination of the surface of the stomach reveals no vascular solution of continuity; and the inference is almost irresistible that the hemorrhage was a mere transudation. In these cases, the gastric mucous membrane is sometimes quite healthy both in consistence and colour; but, more frequently, it exhibits evidence of congestion or inflammation, in a greater or less degree of vascular redness, sanguineous effusion into the mucous or submucous tissue, or of softening. In some instances, dark points appear thickly strewed over the mucous surface. Sometimes ulcers are discovered, with their surfaces covered over with thin coagula, or exhibiting specks here and there, at points from which the hemorrhage probably proceeded. Sometimes large vessels are found opened by ulceration.

Treatment.—The patient should be placed in bed, and kept perfectly quiet both in body and mind. He should take a little ice-water now and then, and may even swallow small pieces of ice if agreeable to him. At the same time,

excitement should be directed towards the extremities by immersing the hands and feet in hot water. When the hemorrhage is very copious, it has been recommended to apply ice or cold water to the epigastrium.

If there should be much nausea, retching, and ineffectual effort to vomit, with the discharge of a little coagulated blood, giving rise to the suspicion that much more blood might be remaining in the stomach, and serving as a source of irritation, it might be proper to effect its complete evacuation by a moderate dose of ipecacuanha. The action of the medicine would be less likely to provoke hemorrhage than the spontaneous movements alluded to, and after its operation the stomach would probably be left comparatively quiet. But, under ordinary circumstances, emetics are of doubtful propriety.

Should the pulse be excited, and of sufficient strength, and especially if, at the same time, there be symptoms of gastric inflammation or vascular irritation, blood should be taken from the arm, in quantities proportioned to the effect of the operation upon the pulse; and a continuance of the same circumstances would justify a repetition of the measure. Sometimes, when the patient is too feeble to admit of bleeding, and the local symptoms alluded to exist, leeches to the epigastrium may be substituted; and these will often be found useful auxiliaries to the lancet. The system, however, is often too much exhausted to admit of depletion in any shape. Sinapisms and blisters to the epigastrium may then be used.

When the patient is very prostrate, with a pale and cold skin, and a feeble or absent pulse, much advantage may sometimes accrue from the hot bath, of the temperature of about 105°, by which the blood is drawn to the surface, and a safe stimulus applied to the system. The same remedy may also be used in less prostrate conditions, in the more advanced stages of the disease, when it is deemed highly advisable to give a centrifugal direction to the blood.

Acetate of lead, in small and frequently repeated doses, combined with a little opium, is one of the most efficient internal remedies. If this should be rejected, or should fail from other causes, recourse may be had to other astringents, such as alum, kino, catechu, krameria, aromatic sulphuric acid, and some of the liquid preparations of iron. But these are incompatible with much irritation, and with acute inflammation of the stomach. In the advanced stages, and in cases of little or no local excitement at the commencement, oil of turpentine, or creasote, with or without laudanum, may be given in small doses. The former is peculiarly adapted to the hemorrhage which sometimes occurs in the last stage of gastric inflammation. Ergot might be tried with some hope of advantage; but it occasionally nauseates, and the author has not employed it in this hemorrhage.

Excessive irritability of the stomach should be allayed by lime-water and milk, if not incompatible with the case, by injections of laudanum, and by a sinapism or blister over the stomach. The bowels should be kept open, when the stomach is irritable, by enemata; when it is retentive, by mild cathartics, as the Seidlitz powders, magnesia, sulphate of magnesia, castor oil, &c. Sometimes active purgation is indicated, especially in congestion of the portal circle, and then infusion of senna with Epsom salt may be used.

When the liver is in fault, the hepatic secretion should be promoted by minute and frequently repeated doses of calomel or mercurial pill, alternated with mild cathartics; and this plan should be pursued until the stools exhibit yellow bile, or the gums of the patient are touched. In some cases, it is possible that a purgative dose of calomel would act more efficiently; but in general the alterative plan is preferable as the safer. Both in hepatic and splenic cases, remedies should be employed calculated to relieve the disease of these organs respectively. In splenic cases, advantage will often accrue from the combined use of iron, quinia, and purgation.

nary consumption, that the two are usually associated in the common mind; and hence the dread with which this hemorrhage is almost universally regarded. The notion was formerly very prevalent, even among medical men, that the hemorrhage was the incipient step in the disease, the efficient cause in fact of the fatal symptoms which followed. Pathologists now generally, and, as I believe, more justly, regard it as a mere symptom of a previous pathological condition, and alarming only from the fatal character of the affection, the existence of which it intimates. Hæmoptysis is associated with tuberculous disease in three different modes.

1. It is probable that the scrofulous or tuberculous predisposition constitutes also a predisposition to hemorrhage. We see this often in epistaxis. The morbid tendency may, in either case, depend upon the state of the blood, upon that of the capillary vessels, or upon both conjoined. In persons of the age at which tubercles are most apt to be deposited in the lungs, the circumstances which give this direction to the deposition of tuberculous matter would probably dispose to the extravasation of blood in the same locality. The priority of one or the other of these affections would depend upon accidental causes. Hence it happens that hæmoptysis occasionally precedes the deposition of pulmonary tubercles. It is not that the hemorrhage induces the subsequent disease. Both are the mere consequences of a previous morbid state of system. There may be cases, in which the first appearance of the hemorrhage, and the commencement of tuberculous deposition coincide. In these the result may be ascribed to some local irritation, which calls the tendency simultaneously into action in both directions. It does not, however, follow that hæmoptysis, even in persons of a tuberculous predisposition, must always be succeeded by consumption. The fact is often otherwise. If the hemorrhage has of itself any tendency to favour the development of tubercles, it is probably only through the depression of system, occasioned by the loss of blood, and the very natural anxiety and alarm of the patient.

2. Though hæmoptysis occasionally precedes the evidences of tuberculous deposition in the lungs, yet it much more frequently does not take place until after that event. It is not necessary to the occurrence of the hemorrhage, that the tubercle should have advanced to the ulcerative stage. Much more frequently the first attack of spitting of blood is experienced while the tubercles are yet solid. It may, in these cases, be partly dependent upon the general diathesis, as in those above alluded to; but its great comparative frequency leads necessarily to the inference, that the tubercles themselves have some agency in its production. They probably act both by irritating, as foreign bodies, the mucous membrane of the neighbouring bronchia, and by diminishing the capacity of the lungs, thereby rendering a distension of the permeable vessels necessary for the accommodation of the blood sent to these organs.

3. After the tubercles have advanced to maturation and ulceration, hemorrhage is, in many cases, very frequent, occurring sometimes without premonition, but often with the usual preliminary symptoms of irritation or congestion. In this stage of the disease, the bleeding may be owing to the opening of a vessel by ulceration, and, when sudden and profuse, is perhaps justly ascribable to that cause. Generally, as the work of ulceration advances, it is preceded by the inflammatory process of adhesion, which obliterates the caliber of the vessels; but this does not always take place, and is especially liable to be wanting in those bands which are occasionally observed running across tuberculous cavities, with a considerable blood-vessel contained in them. M. Renaud observed, in one case, a small tubercle in contact with the surface of a blood-vessel, the coats of which, except the inner one, had been absorbed, without the obliteration of the cavity. The softening and evacuation of a tubercle, thus situated, might readily form a communication between

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nected with dilatation. It may also result from disease of the left side of the heart, especially of the auriculo-ventricular orifice, which, when contracted, opposes the return of the blood through the pulmonary veins, and, when enlarged or imperfectly closed by the valve, allows the blood to regurgitate under the contraction of the hypertrophied left ventricle, and thus not only passively impedes its return from the lungs, but causes a direct and powerful pressure upon the vessels which convey it. A case has been recorded in which effusion of blood into the lungs appears to have arisen from the presence of a large fibrinous clot in the left ventricle. (*Med. Times and Gaz.*, Dec. 1855, p. [illegible].) The symptoms of hæmoptysis, in these cases, are mingled with those of diseased heart, so that it is not always possible to determine how much belongs to one, and how much to the other cause. The oppression and dyspnœa are often exceedingly distressing. The hemorrhage itself is seldom very copious, and is often not greater than is sufficient to tinge the mucous expectoration. It not unfrequently assumes the form of pulmonary apoplexy.

With Aneurism.—Aneurisms of the large vessels sometimes burst into one of the bronchial tubes, or into the trachea, producing a gush of blood which is usually almost immediately fatal. The hemorrhage sometimes affords the first positive intimation of the existence of the aneurism, which is revealed upon examination after death. The physician has, in general, no opportunity of examining such cases until after the fatal issue. Sometimes, however, the opening into the air-passage is very small, and coagula existing in the tumour afford some impediment to the escape of blood. In these instances, the bleeding may be moderate for a time, and undistinguishable from ordinary hæmoptysis, unless evident signs of aneurism exist; and even then the diagnosis is by no means certain.

Vicarious Hæmoptysis.—Bleeding from the lungs may be vicarious to the menses, to hemorrhage from the rectum, to epistaxis, or to other habitual discharges. But it is only its association with the menstrual function that requires particular notice. This association is often accidental, the same disease producing both the hemorrhage and the suppression of the menses, as in the case of phthisis. Frequent hæmoptysis may possibly even induce amenorrhœa. But, in both these instances, the hemorrhage has nothing in it peculiar. It is only when the spitting of blood comes on in consequence of retention, suppression, or deficiency of the menses, that it assumes the proper vicarious character. In such cases, it is apt to recur monthly, at the usual menstrual period, and is, on each occasion, frequently preceded by those symptoms of constitutional disturbance which so often anticipate the appearance of the menses. It is not essentially associated with any form of organic disease, and is generally an innocent variety of hemorrhage. Its suppression might, indeed, without a restoration of the discharge for which it is substituted, be attended with some danger. A monthly hæmoptysis is said sometimes to have occurred in men, as a substitute for a suppressed hemorrhoidal flux which had appeared with the same interval. I have, in some instances, noticed that the discharge, when vicarious to the menses, consisted of a rather thin, bloody, uncoagulable liquid, instead of ordinary coagulable blood; and also that sometimes, instead of being periodical, it is continuous during long periods of time.

Treatment.—It may be considered as always proper to attempt to arrest hæmoptysis. There is no doubt that, in many cases, the affection is rather salutary than injurious, by relieving irritation and congestion in the lungs, or by serving as an outlet for blood that might otherwise possibly be effused even in a more dangerous situation. But we have no means of accurately discriminating such cases; and, as the hemorrhage is sometimes dangerous, we cannot be certain that it may not become so in any case. Besides, when there are evidences of serious irritation, congestion, plethora, &c., we have the power of relieving them by safer methods, such as general and local depletion, measures of revulsion, and regulation of the diet.

The patient should be placed on his back in bed, with his head and shoulders considerably elevated, and thus supported by pillows or a bed-chair. All the clothing which has any effect in restraining the freedom of respiration, such for example as may compress in the least degree the chest or abdomen, should be loosened or removed. The body should be kept comfortably warm by bedclothes, while the air of the apartment is fresh and cool, and for this purpose the room should be well ventilated. The patient should be enjoined to keep perfectly at rest, moving his body or limbs as little as possible, never speaking except when necessary, and restraining the disposition to cough as much as he conveniently can. All sources of agitation or excitement should be avoided. On this account, as well as to keep the air pure, no one besides the necessary attendants should remain in the apartment. The physician should endeavour to allay the agitation of the patient by the calmness of his own deportment, and by all proper assurances of safety. These measures are not all essential in slight cases. Persons attacked with hæmoptysis occasionally continue to pursue their usual avocations, yet recover perfectly, without serious inconvenience. But this course is hazardous; fatal results might follow neglect; and it is the duty of the physician to act, in every case, as if danger were to be apprehended.

As soon as the patient is properly disposed in bed, he should take into his mouth a heaped teaspoonful or more of common salt, undissolved, and swallow it as he best can; and the dose may be repeated if necessary. This remedy seldom fails to check the hemorrhage for a time. Its method of operating is probably by a rapid revulsion from the lungs to the irritated mucous membrane of the mouth, fauces, pharynx, and œsophagus. The same method of arresting a sudden return of the bleeding may be resorted to in the course of the complaint.

It has generally been considered proper to take blood from the arm in hæmoptysis. Indeed, this affection was at one time almost inseparably associated, in the minds of many practitioners, with the necessity for venesection. But discrimination is, I believe, as important here as in other diseases, and much injury has resulted from the improper use of the lancet. From robust individuals, with a full, strong pulse, and other signs of plethora or morbid excitement, and especially when local irritation or active congestion in the lungs is obvious, blood should be taken promptly and freely, no matter what may be the precise origin of the hemorrhage; and, if the symptoms are not relieved by one operation, it should be repeated, at intervals varying with the circumstances of the case. The objects of bleeding are two-fold; *first*, to diminish the distension of the vessels by lessening the quantity of the circulating fluid and the force of the heart's action, and, *secondly*, to alter the character of the blood. The indication for the first of these effects is obvious. To accomplish the object as effectually as possible, the blood should be withdrawn suddenly, by a large orifice, so as to bring on a slight tendency to faintness, and thus give the bleeding orifices the opportunity to close under the greatly diminished impulse of the blood. The second effect, that, namely, of altering the character of the blood, is important towards a permanent cure. So long as the red corpuscles are in excess in relation to the fibrin, there will be danger of a continuance or renewal of the hemorrhage; and experiment has shown that the corpuscles diminish under the lancet, much more rapidly in proportion than the fibrin; the latter being apparently more easily supplied by the processes concerned in sanguification. Hence the propriety of a repetition of the bleeding, so long as the fulness and strength of pulse, and existence of plethora, appear to require it. Should symptoms of *apoplexy of the lungs* exist, the necessity for prompt and ample depletion is even more urgent than in ordinary cases.

In many cases, when the symptoms above mentioned are not so prominent, blood may still be taken, but more moderately, and more in reference to the ultimate condition of the system. But, when the patient is rather delicate, and the pulse, though frequent, is feeble, general bleeding should not be resorted to, unless the hemorrhage is alarming from its quantity, or obstinately resists other measures. In such cases, any irritation or active congestion of lungs that may exist, should be relieved by local depletion and revulsion. In passive hæmoptysis, bleeding is seldom necessary or proper.

The existence of tubercles in the lungs, or a strong tendency to them, should be allowed to weigh against bleeding, when the balance between the two opposite courses is, in other respects, doubtful. Even in this case, if the coexistence of plethora and excitement appears to call for the remedy, it should be employed, though with more caution than under other circumstances. Blood should be withdrawn in small quantities and less frequently. If the patient is feeble, and the indications for blood-letting not very decided, it should be omitted altogether. In consumption, it is of great importance to husband the resources of the system. Debility strongly favours the deposition of tuberculous matter. Our only hope from therapeutical measures is in the counteraction of this predisposition. Whatever, therefore, exhausts the patient, and consequently an improper use of the lancet, contributes to the progress and danger of the disease. There can be little doubt that the old methods of treating hæmoptysis frequently hastened the fatal result of consumption; and it is highly probable that the disease was developed or rendered incurable, when, under a different course, it might either have been averted or conducted to a favourable issue. The patient, bled largely and repeatedly, though perhaps with little blood to spare, fell into a state of prostration, with a pale and almost bloodless surface, a feeble and frequent pulse, and altogether without energy to resist the disease which was lying in wait to seize him, or had already fixed itself upon his system. I have often known consumptive patients with occasional attacks of hæmoptysis, which they have disregarded, pursuing their usual avocations as if nothing had happened, and using no means whatever to suppress the hemorrhage, or only such as did not interfere with their engagements. I have known such patients to recover, without difficulty, from their temporary attacks, and to live for a long time, sometimes for many years, when probably, if strictly confined and copiously depleted, they would have sunk in the course of a few months. I do not advocate this plan; for a judicious treatment, including even moderate depletion, may be very useful; but it would, in my judgment, be much better, upon the whole, to leave the hemorrhage of consumptive individuals altogether to nature, than to treat it with indiscriminate bleeding.

In cases attended with febrile excitement, refrigerant cathartics and diaphoretics may be employed as auxiliary to the lancet, or as substitutes, where it may be contraindicated. Sulphate of magnesia, Seidlitz powders, bitartrate of potassa, the neutral mixture or effervescing draught, nitre, and tartar emetic in small doses, are, upon the whole, the most suitable medicines. Should the pulse be very frequent, and rather feeble than strong, digitalis may be sometimes added with advantage to the other remedies. When purged, the patient should not be allowed to rise from his bed, but should make use of the bed-pan. At the same time, he may take cold and refreshing drinks, as ice-water, solution of gum arabic, lemonade, &c. Whatever he employs, either as drink or food, should be cold.

During the employment of the above measures, should symptoms of inflammatory or irritative action in the chest be obvious, cups or leeches should be applied to the breast or sides, or between the shoulders, according to the seat of the affection; and these should be followed in due time by blisters, if the symptoms do not yield. When the debility is too great to admit even of local bleeding, dry cups applied freely over the chest will sometimes do good; and, if neither method be deemed advisable, a blister may be resorted to. Hot and stimulating pediluvia, the introduction of the hands and arms into similar liquids, the tourniquet to the arms or legs, and sinapisms or blisters to the extremities, are other remedies which co-operate to the same end. When the hemorrhage is alarmingly copious, cold water may be applied to the breast, back, and axilla; but this measure should be resorted to with caution, from the fear of internal inflammation. While on the subject of local remedies, it may be stated that, in long-continued and obstinate cases, in which the hemorrhage ceases and returns irregularly, a constant revulsion towards the extremities should be established by means of issues, setons, and blisters.

After general excitement has been sufficiently subdued, and at the commencement of the case when the degree of excitement is moderate, acetate of lead should be employed internally. This is one of the most efficient remedies in hæmoptysis, and is peculiarly adapted to the early stages, by its union of sedative and astringent properties. From half a grain to two grains may be given every hour or two hours, according to the urgency of the symptoms, and the condition of the stomach. It will often be found useful to combine it with a little opium, which quiets cough, and renders the salt more acceptable to the stomach, and with ipecacuanha, when this is not forbidden by its nauseating effects. During the use of the acetate, the bowels should be kept open by injections. Should febrile action return, the remedy may be suspended, and recourse again had to refrigerant medicines. The acetate should not, as a general rule, be pushed beyond the quantity of twenty-four or thirty-six grains, without intermission; as it might endanger an attack of colica pictonum. In ordinary active hemorrhage from the lungs, little can be expected from astringents, should the preparation of lead fail.

The happiest effects sometimes result from ergot in this complaint. I have seen it promptly successful, under circumstances which appeared to me not to admit a doubt of its efficacy. It may be employed in cases to which the acetate of lead is adapted, and as a substitute for that salt when it fails to produce the desired result. Ten grains may be given every two hours, and continued for a day or two, or until the hemorrhage ceases, when the intervals between the doses should be gradually prolonged. I have seen no other unpleasant effect from its use in this way than occasional nausea. Should this be considerable, the ergot may be omitted or diminished. It should not be employed in cases of hæmoptysis occurring during pregnancy.

Another hemostatic medicine which sometimes acts very promptly and efficiently in hæmoptysis is oil of turpentine. How it operates is not well understood, though probably by some influence upon the capillaries, perhaps through the sympathetic nerve-centres. It is applicable to cases without inflammatory action or febrile excitement; and, if plethora exist, it should be subdued before recourse is had to the oil. Mere frequency of pulse does not contraindicate it. I have found no remedy more efficacious than this under circumstances favourable to its use. In one apparently desperate case, it succeeded after failure with all other means. Ten drops of it may be given every hour or two. If the hemorrhage is very copious, the dose may be much larger.* The tincture of larch bark has been found very useful by Dr. Owen Daly, of Hull,

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* I first employed this remedy in hæmoptysis more than thirty years since, having derived my first impressions in its favour from Dr. James L. Pierce, then a student of medicine, who was much afflicted with this disease, and had found the oil of turpentine a most effectual remedy in his own case. (*Note to the sixth edition.*)

England, who ascribes its virtues to its conjoined astringent and terebinthinate properties. (*Med. Times and Gaz.*, Nov. 1859, p. 476.) It is highly probable that the oil of Canada fleabane is capable of exercising an influence over pulmonary hemorrhage analogous to that of the oil of turpentine. In a case of profuse pulmonary hemorrhage, under the care of Dr. J. W. Moorman, of Hardinsburg, Ky., fifteen drops of it given internally, and ten drops administered by inhalation, put an almost immediate end to the bleeding. (*Am. J. of Med. Sci.*, Oct. 1865, p. 397.)

When no decided local irritation, general fever, or plethora, exists, and especially when the surface is pale and the pulse feeble, alum and the vegetable astringents, as tannic and gallic acids, kino, catechu, rhatany, geranium, galls, &c., may be used in the form of solution or infusion. The compound infusion of roses of the Pharmacopœias is an agreeable and useful drink in some of these cases, especially when attended with night-sweats. The infusion of wild-cherry bark, with or without small doses of aromatic sulphuric acid, may be used advantageously under similar circumstances.

Sometimes an emetic of ipecacuanha proves highly efficacious in cases of the kind last mentioned. It should not be employed during the existence of plethora, and febrile or great vascular excitement.

Passive hemorrhage from the lungs requires the same treatment as hemorrhage of the same character from other parts. The astringents, oil of turpentine, the mineral acids, the preparations of Peruvian bark and of iron, and a nutritious diet are the chief remedies. Wine or malt liquors may sometimes also be usefully employed.

In all cases, after the reduction of undue vascular action, general and local opiates are useful by allaying cough, and thus preventing one of the strongest and most frequent provocatives of hæmoptysis. Their stimulating properties may often be usefully modified by combination with ipecacuanha. When from any cause opium is contraindicated, hyoscyamus may be substituted for it in reference to the same indication.

When hæmoptysis depends upon disease of the heart, bleeding, general and local, rest, digitalis, and American hellebore are the chief remedies; though any of those above mentioned may be employed, under favouring circumstances.

Vicarious hemorrhage from the lungs requires to be treated with some caution. If very moderate, the attack may often be allowed to run its course without disadvantage; but, when considerable, it should always be met by remedial measures; care being taken to prevent injurious consequences by inviting the current of blood towards the seat of the suspended discharge, by means of leeches to the part, warm fomentations, and stimulant applications. When the hemorrhage has resulted from a retrocession of gout or rheumatism, this should be recalled to its original position by the application of hot water or stimulating infusions, followed by sinapisms or blisters.

The diet must be varied according to the character and stage of the hemorrhage. When it is active, and in the early stages, the food should consist chiefly of cold farinaceous or mucilaginous drinks. When there is no excitement, and yet no marked debility, solid vegetable food is admissible, and sometimes rennet-whey, or milk may be added to the other articles. In decided convalescence, especially when the system is enfeebled, and consumption exists or is threatened, light and easily digested animal food may be allowed, such as soft-boiled eggs, oysters, boiled meats, weak broths, jellies, and the white flesh of poultry. In strictly passive hæmoptysis, the most nutritious food may in general be used.

To prevent the return of the bleeding, recourse must be had to the measures already detailed under the head of hemorrhage in general. The most important are moderate exercise on horseback and on foot, free exposure to the open air in suitable weather, a proper attention to the clothing, which should be such as to protect the body against atmospheric vicissitudes, a moderate diet, the avoidance of stimulating drinks in excess and all other causes of direct excitement, and the preservation of all the functions in the healthiest possible condition. A long sea voyage, and a residence during winter in a warm and equable climate, are also highly useful. These precautions are recommended chiefly as protective against the development or advance of phthisis. When there is no reason to suspect the existence of that disease, or a predisposition to it, and when the hemorrhage appears to depend upon a plethoric state of the circulation, the diet should be for some time exclusively vegetable; an occasional dose of sulphate of magnesia or other saline cathartic should be employed; and, when the symptoms are threatening, recourse may be had to the lancet. But, as the evidences of plethora disappear, these measures should be gradually moderated, and at length abandoned, when the health seems to have been perfectly re-established.

Article V.

HEMORRHAGE OF THE STOMACH, OR HÆMATEMESIS.

Syn.—Vomiting of Blood.—Gastrorrhagia.

THE term hæmatemesis (derived from αἷμα, blood, and ἐμέω, I vomit) signifies literally *vomiting of blood*, but is employed, in its technical sense, to signify hemorrhage of the stomach, which, though usually attended with vomiting of blood, is not always so, and does not necessarily exist, even when blood is vomited; as this fluid may be swallowed and afterwards ejected, without any gastric hemorrhage. The complaint is not uncommon in this country, though much less frequent than epistaxis or hæmoptysis.

Symptoms, Course, &c.—An attack of hæmatemesis is sometimes preceded by loss of appetite, and a feeling of oppression, weight, fulness, heat, &c. in the epigastrium, with pain or tenderness on pressure; symptoms which indicate the existence of irritation or inflammation of the gastric mucous membrane. Occasionally, also, general uneasiness, chilliness or rigors, and subsequent febrile reaction are experienced. These phenomena yield, after a time, to nausea, dizziness, faintness, paleness of surface, and depression of pulse; in the midst of which vomiting of blood takes place, with the frequent effect of partially relieving the antecedent symptoms. In many instances, however, the vomiting is preceded only by sickness of stomach, and its usual attendant phenomena, without any signs of local or general excitement. In some cases, especially those in which malignant diseases are accompanied with hæmatemesis, the patient does not even experience nausea, but discharges the blood in mouthfuls, by a sort of regurgitation rather than by vomiting. Tenderness in the epigastrium is apt to continue after the stomach has been evacuated, and pressure in this region sometimes occasions emesis. Pain and tenderness in one or both hypochondriac regions, costiveness, and sallowness of skin mark a complication of the complaint with disease of the liver or spleen. From the combined effects of nausea and loss of blood, the system is sometimes very much depressed; the surface being cold and bloodless, the pulse absent or scarcely perceptible, and the patient in a state of partial or complete unconsciousness. In this condition he occasionally is when first seen by the physician; the hemorrhage having ceased in consequence of the depressed state of the circulation. The system, however, generally reacts, with or without a return of the hemorrhage. In some cases, febrile symptoms, with a furred tongue, attend the complaint throughout its course.

When there is reason to suspect erosion of a blood-vessel, the general plan above indicated may be pursued; care, however, being taken to avoid all substances that might irritate the stomach. Perfect rest is the most important measure in these cases. Bleeding is seldom, if ever, admissible.

In vicarious hæmatemesis, besides employing the means already mentioned, the practitioner should endeavour to produce a derivative effect towards the seat of the suppressed discharge by leeches, warm fomentations, and stimulating applications to the part. In cases of amenorrhœa, constitutional means should be employed for the restoration of the menses. In these cases, purgatives have been found highly beneficial.

In passive hæmatemesis, the plan must be pursued which has already been pointed out, as applicable to the passive hemorrhages generally. (See page 332.) The chief remedies are the astringents, mineral acids, sulphate of quinia, the chalybeates, and oil of turpentine.

Attention to the diet is important. In cases attended with local or general excitement, the patient should be confined to gum-water and farinaceous drinks. If debilitated, he may take rennet-whey, or diluted milk. Milk with lime-water sometimes answers an excellent purpose. In great debility, as when the hemorrhage is passive, animal broths, jellies, egg beat with wine, and sometimes milk-punch may be employed. When the stomach rejects everything, the patient must be supported by nutritive enemata. In convalescence, only the lightest and most digestible animal food should be allowed.

The prophylactic measures adapted to hæmatemesis are to be inferred from the remarks already made relative to the general preventive treatment of hemorrhage; and anything which may be peculiar to this particular form will readily suggest itself to the reflecting practitioner.

Article VI.

HEMORRHAGE OF THE BOWELS, OR MELÆNA.

Hemorrhage of the bowels, though not unfrequent as an incident of various organic affections, is somewhat rare as an original functional disease. In the latter case, it generally assumes the form of melæna; the blood having undergone, after, or in the act of extravasation, such changes as to give the stools the black appearance characteristic of that affection. The name melæna has been rather loosely applied, and ought to be abandoned as designative of a disease. In its most extensive sense, it would include all black discharges from the bowels, whether of vitiated bile or altered blood. In this application of the term it is improper, as it combines two distinct affections under one designation. If confined to hemorrhage, it is inadequate; for there are many instances of intestinal hemorrhage in which the discharges are not black; and there appears to be no good reason for making a mere difference in colour the basis of an arrangement into distinct varieties, especially as every diversity of shade is presented in different cases, from bright arterial redness of the stools to pitchy blackness.

Discharges of black and altered blood from the bowels are often a mere attendant upon hæmatemesis, and not necessarily connected with intestinal disease. A portion of the blood extravasated in the stomach passes the pylorus, and, being changed by admixture with the contents of the bowels, and their chemical reaction upon it, escapes in the form of black stools. Such a result may take place, even without vomiting; the whole of the effused blood passing downward. Again, the black evacuations may be derived directly from the intestinal mucous membrane, though the patient may at the same time

it blood; and this is probably often the case; as the causes which produce atemesis act, in many instances, with scarcely less energy upon the bowels on the stomach. Still another case is that in which, though vomiting purging of blood may exist, the seat of the hemorrhage is exclusively in bowels; the blood rising, as bile is often known to do, from the duodenum the stomach. It is, therefore, by no means always easy to decide, in any icular case of bloody evacuations from the alimentary canal, whether or intestinal hemorrhage, strictly so called, really exists. In forming a conion, we must be influenced by the character of the antecedent and attendsymptoms. According as these point more especially to the stomach or els, will be our inference as to the seat of the hemorrhage; and, if they ally embrace both, we may fairly conclude that the hemorrhage also is both sources. The quantity and colour of the blood dischaged will have influence on our judgment. When it passes by stool copiously, or withgreat alteration, it is, in all probability, of intestinal origin. In some es, however, it is impossible to arrive at a certain conclusion. Happily, is of the less importance; as the causes and nature of the hemorrhage the two sources are so analogous as to give a certain character of idento the affection, in reference to treatment.

Symptoms.—In most cases of intestinal hemorrhage, the discharge of blood receded by evidences of disease. Often, this disease is of a well-known marked character, as enteritis, dysentery, enteric fever, scurvy, purpura, of all of which hemorrhage from the bowels is an occasional concomitant. frequently also the preliminary symptoms are less definite. Feelings oppression, weight, distension, or other uneasiness in the abdomen, pains the hypochondriac regions, occasional tenderness upon pressure, a furred gue, deficient or disordered appetite, constipation or diarrhœa, a pale, sal-, or dingy complexion, dejection of spirits, languor, weakness, and more less disorder of the circulation, indicate a derangement of health of some ation, of which visceral disorder and impaired digestion are the most proent ingredients. A patient in this condition is unexpectedly affected with ping pain, nausea, increased paleness, and more or less giddiness, faintness, pression of pulse, and coolness of the extremities, attended by a discharge m the bowels, which, on examination, proves to be blood of a black colour, y offensive, and otherwise altered in character. Occasionally a diarrhœa existed for some days with more or less of the same symptoms, without, ever, occasioning much uneasiness, until attention is accidentally called to bloody nature of the stools. In some instances, again, the hemorrhage es on without any premonitory symptoms; and the evacuation from the els, and its attendant depression, are the first obvious signs of disease. is depression is sometimes extreme, and the patient may even sink below the int of reaction. Sudden prostration and death have occurred without any ication, and the cause has remained concealed until dissection has revealed vast collection of blood, fluid or coagulated, in the small intestines. In cases sudden prostration, intestinal hemorrhage may be suspected, when the preous symptoms were those of portal congestion, or organic disease of the wels, and when tumefaction of the abdomen with dulness on percussion, not fore existing, is discovered upon investigation. But cases of so much vionce, whether with or without discharge from the bowels, are comparatively re. Very generally the system rises out of the temporary depression, or the fection may even run its whole course without any serious evidences of prosation. Occasionally the bloody evacuations are attended and preceded by cruciating pain, which, however, is to be ascribed to some organic disease the bowels. Quite as often there is little or no pain.

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vomit blood; and this is probably often the case; as the causes which produce hæmatemesis act, in many instances, with scarcely less energy upon the bowels than on the stomach. Still another case is that in which, though vomiting and purging of blood may exist, the seat of the hemorrhage is exclusively in the bowels; the blood rising, as bile is often known to do, from the duodenum into the stomach. It is, therefore, by no means always easy to decide, in any particular case of bloody evacuations from the alimentary canal, whether or not intestinal hemorrhage, strictly so called, really exists. In forming a conclusion, we must be influenced by the character of the antecedent and attendant symptoms. According as these point more especially to the stomach or bowels, will be our inference as to the seat of the hemorrhage; and, if they equally embrace both, we may fairly conclude that the hemorrhage also is from both sources. The quantity and colour of the blood dischaged will have some influence on our judgment. When it passes by stool copiously, or without great alteration, it is, in all probability, of intestinal origin. In some cases, however, it is impossible to arrive at a certain conclusion. Happily, this is of the less importance; as the causes and nature of the hemorrhage from the two sources are so analogous as to give a certain character of identity to the affection, in reference to treatment.

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vomit blood; and this is probably often the case; as the causes which produce hæmatemesis act, in many instances, with scarcely less energy upon the bowels than on the stomach. Still another case is that in which, though vomiting and purging of blood may exist, the seat of the hemorrhage is exclusively in the bowels; the blood rising, as bile is often known to do, from the duodenum into the stomach. It is, therefore, by no means always easy to decide, in any particular case of bloody evacuations from the alimentary canal, whether or not intestinal hemorrhage, strictly so called, really exists. In forming a conclusion, we must be influenced by the character of the antecedent and attendant symptoms. According as these point more especially to the stomach or bowels, will be our inference as to the seat of the hemorrhage; and, if they equally embrace both, we may fairly conclude that the hemorrhage also is from both sources. The quantity and colour of the blood dischaged will have some influence on our judgment. When it passes by stool copiously, or without great alteration, it is, in all probability, of intestinal origin. In some cases, however, it is impossible to arrive at a certain conclusion. Happily, this is of the less importance; as the causes and nature of the hemorrhage from the two sources are so analogous as to give a certain character of identity to the affection, in reference to treatment.

Symptoms.—In most cases of intestinal hemorrhage, the discharge of blood is preceded by evidences of disease. Often, this disease is of a well-known and marked character, as enteritis, dysentery, enteric fever, scurvy, purpura, &c., of all of which hemorrhage from the bowels is an occasional concomitant. But frequently also the preliminary symptoms are less definite. Feelings of oppression, weight, distension, or other uneasiness in the abdomen, pains in the hypochondriac regions, occasional tenderness upon pressure, a furred tongue, deficient or disordered appetite, constipation or diarrhœa, a pale, sallow, or dingy complexion, dejection of spirits, languor, weakness, and more or less disorder of the circulation, indicate a derangement of health of some duration, of which visceral disorder and impaired digestion are the most prominent ingredients. A patient in this condition is unexpectedly affected with griping pain, nausea, increased paleness, and more or less giddiness, faintness, depression of pulse, and coolness of the extremities, attended by a discharge from the bowels, which, on examination, proves to be blood of a black colour, very offensive, and otherwise altered in character. Occasionally a diarrhœa has existed for some days with more or less of the same symptoms, without, however, occasioning much uneasiness, until attention is accidentally called to the bloody nature of the stools. In some instances, again, the hemorrhage comes on without any premonitory symptoms; and the evacuation from the bowels, and its attendant depression, are the first obvious signs of disease. This depression is sometimes extreme, and the patient may even sink below the point of reaction. Sudden prostration and death have occurred without any evacuation, and the cause has remained concealed until dissection has revealed a vast collection of blood, fluid or coagulated, in the small intestines. In cases of sudden prostration, intestinal hemorrhage may be suspected, when the previous symptoms were those of portal congestion, or organic disease of the bowels, and when tumefaction of the abdomen with dulness on percussion, not before existing, is discovered upon investigation. But cases of so much violence, whether with or without discharge from the bowels, are comparatively rare. Very generally the system rises out of the temporary depression, or the affection may even run its whole course without any serious evidences of prostration. Occasionally the bloody evacuations are attended and preceded by excruciating pain, which, however, is to be ascribed to some organic disease of the bowels. Quite as often there is little or no pain.

The character of the blood discharged is very various. The quantity is

sometimes scarcely more than sufficient to stain the fecal evacuations, while in other instances it may amount to pints or quarts. The colour may be bright-red; but is much oftener dark, or almost black. The consistence of the blood may be fluid, or grumous from broken coagula, or thick, semi-liquid, and tar-like. It is sometimes mixed with the intestinal secretions, fecal matter, or bile, and sometimes as pure as if drawn from the arm. It is almost always very offensive. In certain cases, it is black, like soot or coffee-grounds, consisting of an insoluble dark matter floating in a colourless liquid; but, when of this condition, it can scarcely be called blood; as it has probably undergone some change in its passage from the vessels. This kind of discharge is not necessarily offensive, and exhibits neither the red colour of blood nor the yellowness of bile, when viewed in thin layers. The black colour, so common in the different hemorrhagic discharges from the bowels, is not an indication that the blood comes from the veins; but is generally ascribed to the chemical influence of the intestinal fluids and gases.

The nature of the evacuations may lead to plausible inferences as to the seat and character of the disease. If the blood is bright-red, it has probably come from the large intestines; if dark-red, copious, and pure, from the small intestines, and from no very great extent of surface. If tarry or pitch-like, the inference is that it has proceeded from an ample surface, by a slow exudation, giving it an opportunity to be intimately mingled with the secretions. If of the appearance of coffee-grounds, it has probably issued from a membrane disorganized by inflammation or malignant ulceration, as in yellow fever and cancer of the bowels. A small discharge of bright blood, mingled with mucus, would imply that there was active inflammation, as in dysentery. If the blood is dark, and either imperfectly or not at all coagulable, it indicates that it was depraved while still in the circulation, as in malignant fevers and purpura. If black, tarry, and exhibiting, in thin layers, both a red and bilious tinge, it may possibly, as maintained by Dr. Ayre to be generally the case in melæna, have proceeded from the liver.

The course of the disease is altogether uncertain. The hemorrhage, as already stated, may prove immediately fatal, but this result is rare. Generally, the bleeding is diminished or suspended for a time, to return again and again; and the disease may go on for weeks or months, with alternations of amendment and relapse, until at length it ceases, or wears out the patient. But, if not complicated with serious organic derangement of the bowels or other viscera, it will generally yield with sufficient facility to remedies; though, even after a cure, the predisposition is too apt to remain, and lead to a return. Something depends upon the age as to the result. In the old, the disease is much more apt to end fatally than in youth or middle life, perhaps because the result of a longer continuance of organic disorders, and a general breaking up of health. When not complicated with such affections, or with deep depravity of the blood, it has usually, in the experience of the author, proved manageable, whether in the aged or the young. If considerable, it adds greatly to the dangers of diseases with which it may be associated.

It needs scarcely be stated that the general symptoms attending hemorrhage from the bowels are so exceedingly variable, from the variety of disease with which it is connected, that no one description will embrace them.

Anatomical Characters.—Blood is always found in the bowels, of a character bearing some analogy with that discharged. The mucous membrane is frequently stained by imbibition. Both it and the veins leading from it are often found congested; but the congestion of the capillaries appears to have been sometimes relieved by the hemorrhage, and the membrane is unusually pale. The orifices of the mucous follicles are occasionally seen distended with black coagulated blood, looking like sooty specks upon the surface. Dissection has in general afforded no ground for the notion that the blood proceeded from a ruptured or eroded vessel. The mucous membrane has been examined with the greatest care, without exhibiting any vascular solution of continuity. This is not the place to detail the numerous morbid changes of structure belonging to the disease, of which the hemorrhage is frequently but a symptom.

Diagnosis.—On the occasional confusion of this hemorrhage with hæmatemesis enough has been already said. It may be distinguished from the black bilious discharges which are frequently met with as a form of diarrhœa, by viewing the two liquids in thin layers, or by diluting them. The blood, under this management, usually assumes its proper red, and the bile its yellow hue. Common salt, when added to dark blood, is said to redden it, and does not produce the same effect with bile. The microscope may be resorted to in doubtful cases. Sometimes true melanotic matter is discharged from the bowels, and might be mistaken for hemorrhage. It probably proceeds from the breaking up of a melanotic tumour, and is very rare. It wants the redness of blood. (See *Melanosis.*) For the distinction between the hemorrhage under consideration, and that from the rectum or hemorrhoidal vessels, the reader is referred to the subsequent article.

Causes.—These are so much the same as in hæmatemesis, that a particular enumeration of them is unnecessary. Whatever is capable of producing irritation, congestion, inflammation, or ulceration of the intestinal mucous membrane, may occasion this form of hemorrhage. Among the direct irritants it will be sufficient to allude to drastic cathartics, which, in cases of predisposition to this disease, would be very apt to bring on an attack. The remarks made in relation to the various pathological conditions which lead to hæmatemesis are also applicable here. Inflammation and ulceration of the mucous coat, as in enteritis, dysentery, invagination, &c.; disease of the liver and spleen; cancerous and other malignant ulcerative affections; solid tumours; aneurisms; organic affections of the heart; suppression of the menses; malignant fevers, purpura, and scurvy; are all occasionally attended with hemorrhage from the bowels. The most common pathological condition in this, as in gastric hemorrhage, especially in the form of melæna, is probably congestion of the portal system, dependent on torpor or organic disease of the liver, or enlargement of the spleen. Hence its occasional occurrence in protracted intermittents, and association with abdominal dropsy. Enteric fever, uniting occasionally the two conditions of a hemorrhagic state of the blood, and an inflamed and ulcerated state of the bowels, is liable to very serious and often fatal complication with intestinal hemorrhage. In a fatal case, which had been attended, during life, with vomiting of greenish matter, Prof. Oppolzer found, at a post-mortem examination, the whole tract of the bowels, from the duodenum to the middle of the transverse colon, to be in a state of gangrene, dependent upon a coagulum in the trunk of the superior mesenteric artery, completely obstructing the passage of blood. (*Med. T. & Gaz.*, Sept. 1862, p. 263.)

Treatment.—In the treatment of this hemorrhage, reference must always be had to the pathological state in which it originated, and which may sustain it. To this state the remedies are to be addressed. If the hemorrhage is not abundant, no other treatment will, in general, be required. Most commonly the liver or spleen, or both, are in fault, especially in melæna. If the hepatic affection is merely functional, an alterative course of mercury, as recommended by Dr Ayre, will generally prove effectual. One-sixth of a grain of calomel, or from half a grain to a grain of the mercurial pill, may be given every hour or two, until from one to three grains of the former, or from three to nine of the latter, have been taken during the day. If the case is not urgent, the mercurial may be omitted on alternate days; if otherwise, it should be pushed steadily until the passages assume a healthy appearance or the gums are touched.

The patient should be kept at rest mentally as well as bodily, should breathe a cool fresh air, and should be allowed refreshing drinks, in small quantities at a time.

After the hemorrhage has ceased, a strict attention should be paid to the general health, and such a course of remedial or hygienic treatment adopted as the case may seem to call for; one grand rule being always kept in view, to avoid everything likely to irritate the intestinal mucous membrane.

Article VII.

HEMORRHAGE FROM THE RECTUM.

Syn.—*Hemorrhoidal Flux.—Hemorrhoids.—Bleeding Piles.*

HEMORRHAGE from the rectum, though most frequently connected with piles, is by no means necessarily so, but may proceed from the mucous membrane in a perfectly healthy state of the hemorrhoidal vessels, and may depend on the same pathological conditions as the other hemorrhages.

Symptoms, Course, &c.—Before the appearance of blood, the patient frequently experiences a sensation of fulness, weight, aching, or other uneasiness in the region of the sacrum, with heat about the anus, indicating a congested state of the mucous membrane; but the hemorrhage may also take place without premonitory symptoms. The blood escapes by stool, sometimes without effort, sometimes with more or less straining, and is generally but not always attended with feculent discharges. Not unfrequently the hemorrhage first appears after the expulsion of hardened feces. In the great majority of cases it is an accompaniment of hemorrhoidal tumours, either without the sphincter, or, protruded at the time of stool. Occasionally it comes in a full stream, without any antecedent or attendant circumstances to explain the accident.

The quantity of blood may be not more than sufficient to stain the feces or the linen after the discharge, or it may be very large, so as to produce great exhaustion. Its appearance is much diversified, being sometimes dark, when proceeding from a ruptured vein or venous cyst, or long retained in the rectum, and sometimes bright, when from a ruptured artery. It may be observed upon the surface of the feces, or mingled with them in streaks, or altogether unmixed. Sometimes, moreover, it is more or less coagulated, and is not unfrequently mixed with mucus, or with purulent or sanious liquids.

The hemorrhage is, in general, quite irregular in its occurrence and duration, owing to the various local causes which provoke it. But there are cases in which it seems disposed to return at certain intervals, and sometimes it is decidedly periodical. In females it occasionally comes on monthly, as a substitute for the menses, or along with them; and even in men it has been observed to assume the same regularly periodical character.

The bleeding may be inferred to depend upon piles, when tumours are obvious, or can be detected upon a close examination. It is not always possible to determine whether it proceeds from the rectum, or a higher portion of the bowels. But, when the blood is pure, or mixed only in distinct streaks with the feces, and when its discharge has been preceded, for some time, by uneasiness in the sacrum, without any sign of disorder of the upper bowels, the probability is that it is from the rectum. When intimately mingled with the ordinary contents of the bowels, and of a black tar-like aspect, it may be inferred to proceed from some higher position. Occasionally, upon close inspection, the point from which it issues may be seen, upon a protrusion of the mucous membrane as in defecation.

It may generally be very advantageously associated with opium and ipecacuanha in minute quantities, say one-twelfth or one-sixth of a grain of the former, and twice as much of the latter, with each dose of the mercurial. Advantage will often accrue from alternating the mercurial with a mild laxative, as rhubarb or magnesia. When mercury cannot be given, or has been given ineffectually, nitromuriatic acid may be substituted.

Sometimes, however, the discharge is so profuse as necessarily to be the prominent object of attention. It must be arrested or diminished, to avoid the risk of fatal exhaustion, no matter what may be the disease with which it is associated. Under these circumstances, astringents should be combined with the other remedies. Acetate of lead has been much relied on. but the vegetable astringents, particularly kino and rhatany, may also be advantageously given. The latter are sometimes administered, in the form of pill, in connection with the acetate of lead; and, though this is decomposed, the resulting tannate of lead is probably not less useful. In cases of very profuse hemorrhage, requiring a prompt and powerful astringent impression, I have great confidence in powdered kino, given very freely, without much reference to precision of dose. Sulphuric acid, in the form of elixir of vitriol sufficiently diluted, or of compound infusion of roses, is sometimes advantageous, but should not be given simultaneously with the salt of lead. Much may be expected from ergot, with or without opium, in the arresting of the hemorrhage. When the hemorrhage is of the passive character, oil of turpentine is perhaps the most effectual remedy. It may be given in the quantity of from five to twenty drops every hour or two, and may often be beneficially associated with a little laudanum. Dr. H. L. Byrd, of Savannah, Geo., obtained very speedy success in several cases of this hemorrhage, complicated with intermittent fever, from the combined use of oil of turpentine and nitrate of silver. He gave about eight minims of the former every two hours, and one-half a grain of the latter every three hours, each combined with an opiate. (*Charleston Med. Journ. and Rev.*, vii. 164.) When the skin is cool, and the capillaries of the surface generally inactive, the hot bath, or the warm salt-bath repeated daily, will be highly serviceable.

In the form of the disease associated with amenorrhœa, purging has been recommended, to be followed by remedies addressed especially to the menstrual disorder. I have never ventured upon active purging in this affection. Sometimes, perhaps, where the hepatic secretion is arrested, a purgative dose of calomel may be safe and advantageous; but generally, when the bowels are loaded with blood or feces, I prefer their evacuation by the mildest laxatives.

There may be cases in which, from the activity and strength of the pulse, and the plethoric state of the circulation, bleeding may be called for; but this is seldom requisite in cases of intestinal hemorrhage, unless associated with inflammation. Cups or leeches, and fomentations to the abdomen may be indicated in certain cases, and external derivatives are often useful.

It is frequently necessary to support the strength by nutritious food, and sometimes by stimulants. This is especially the case in the hemorrhage attending low fevers. When there is nausea, milk mixed with lime-water will, on the whole, be the most suitable article of diet. The preparations of sago and tapioca, with nutmeg and a little wine, may also be given. Sometimes it will be necessary to resort to animal broths and jellies. Should stimulation be advisable, it may be most safely effected by wine-whey. In cases attended with general excitement, the lightest and least stimulating kinds of food should be employed, such as are applicable to the active hemorrhages generally. Care should be taken to allow no article of food which would be likely to pass undissolved through the stomach. Hence liquid aliment is generally preferable, and fresh vegetables of difficult digestion should be excluded.

The patient should be kept at rest mentally as well as bodily, should breathe a cool fresh air, and should be allowed refreshing drinks, in small quantities at a time.

After the hemorrhage has ceased, a strict attention should be paid to the general health, and such a course of remedial or hygienic treatment adopted as the case may seem to call for; one grand rule being always kept in view, to avoid everything likely to irritate the intestinal mucous membrane.

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Hemorrhage from the rectum is seldom dangerous. In most cases, it is of little or no account, being merely an insignificant attendant on other affections. Sometimes it is beneficial by relieving general plethora, portal congestion, or determination of blood to other parts, especially to the head. It may even, by its long continuance, become essential to health, so that a sudden interruption of it may be dangerous. When copious and frequent, it may induce an alarming condition of anæmia; and cases of this kind, which are apt to be accompanied with great labour of the heart, have sometimes been mistaken for plethora and general excitement, and very injuriously treated by depletion. In some rare instances, life is endangered immediately by the abundance of the hemorrhage.

Causes.—The causes of hemorrhage, in general, are all capable of producing this particular form of it. Among them may be ranked whatever occasions irritation, congestion, or inflammation of the mucous membrane of the rectum, and whatever is capable of wounding this tissue. Of this kind are falls upon the sacrum; hardened feces; straining at stool; drastic cathartics, or others having a peculiar affinity for the rectum, as aloes; medicines which have a tendency to the pelvic viscera generally, as cantharides and oil of turpentine; congestion of the portal circle from disease of the liver or spleen, or from other cause; and suppression of the menses and other habitual discharges. Of all these, portal congestion is probably the most frequent. They are of course much aided by a hemorrhagic state of the circulation, whether consisting in plethora, or an altered constitution of the blood, or in both. Inflammation of the mucous membrane of the rectum is frequently attended with the discharge of blood, which is, however, in this case, not often copious. But by far the most frequent source of this hemorrhage is in hemorrhoidal tumours. The blood may possibly, in some instances, proceed by exudation from the surface of the tumours; but much more frequently the hemorrhage results from a rupture of the dilated vein, or the hemorrhoidal cyst, from an abrasion or tearing of the investing mucous membrane, or from the division of a small vessel that may ramify in the membrane. In the last-mentioned case, the blood may sometimes be seen issuing from the point of rupture. Relaxation of the mucous membrane, leading to prolapsus, may give occasion to the hemorrhage; as may also fissures or small wounds in the folds of the anus. Cancerous and other ulcers of the rectum are often attended with it, the former dangerously so. Like other hemorrhages, this may exist in the passive form, proceeding from vascular relaxation and depraved blood, as in malignant diseases.

Treatment.—When attendant upon hemorrhoidal tumours, this affection requires, in general, no other treatment than that which is extended to the main disease. (See *Hemorrhoids, vol.* i. *page* 794.) It may, however, be so copious as to demand especial attention, and then is to be treated as if it proceeded from other causes. Should plethora exist with general and local excitement, it may be proper to employ the lancet, with cups or leeches to the sacrum; but these remedies are not often necessary. Rest, a cooling and laxative regimen, cold water or ice applied to the sacrum or fundament, or introduced into the rectum, and, if these should fail, the injection of a solution of alum or acetate of lead, or of a vegetable astringent infusion, will generally be found sufficient to arrest the hemorrhage. An enema consisting of three or four fluidounces of a solution of alum, made in the proportion of twenty grains to the fluidounce, and mixed with forty drops of laudanum, repeated daily or twice a day, has almost always answered in my experience. When the hemorrhage proceeds from a single point, pressure may be employed by means of a bougie, or a piece of prepared hogs' intestine, closed at one end, introduced into the rectum, then injected with cold water, and tied at the other end. The effects of constipation should, if necessary, be obviated by laxatives of the most unirritating character; and, if there be plethora or excitement, the saline cathartics, such as bitartrate of potassa, sulphate of magnesia, Seidlitz powders, &c., should be preferred. Congestion of the portal circle should be corrected by an alterative course of mercury alternated with laxatives, and by other means calculated to promote hepatic secretion. Sometimes a full dose of calomel may be found useful. Relaxation of the mucous membrane of the rectum should be treated as directed under the head of prolapsus ani. When the affection is supplementary to the menses, efforts should be made to restore the uterine function. If there be evidences of a determination of blood to the head, the hemorrhage should be checked with much caution; and, if measures for this end are employed, danger to the brain should be obviated by depletion, low diet, &c. The same caution should be observed in correcting a hemorrhoidal flux which has become habitual and constitutional. It is a good rule, under these circumstances, to establish a revulsion towards some point of the surface by means of setons or issues, and at the same time to prevent plethora by attention to the diet, occasional purgation with salts, and, if symptoms of a determination of blood to some vital organ be observed, by the use of the lancet. Passive hemorrhage must be treated by cold applications, astringent injections, and the use of measures calculated to support the system and improve the blood. In such cases, some good might be expected from oil of turpentine, copaiba, cubebs, &c. taken internally; and the same remedies may be found useful in chronic cases of hemorrhage, originally active, when all signs of general and local excitement have ceased.

Article VIII.

HEMORRHAGE FROM THE URINARY ORGANS, OR HÆMATURIA.

Syn.—*Bloody Urine.*

THE term hæmaturia is conveniently applied to the discharge of blood from the urinary passages, no matter from what portion of these passages the hemorrhage may proceed. Considered, however, in reference to its origin (*αἷμα*, blood, and *οὐρέω*, I urinate), it would not embrace bleeding from the mucous coat of the urethra; for the blood from this source escapes without any effort of the patient similar to that of micturition. In this place, the term is employed in its most general acceptation. The complaint is by no means common, except as an attendant upon inflammation of some portion of the membrane lining the urinary passages, and, in this case, is seldom so considerable as to claim particular attention.

Symptoms.—The discharge of blood is sometimes preceded by sensations indicating irritation or inflammation of the part affected, and sometimes takes place without preliminary symptoms. When it proceeds from any other part than the urethra, the blood is expelled by the contraction of the bladder, in the same manner as the urine. Occasionally the discharge is without uneasiness; but, in other cases, there are symptoms similar to those of dysury; the patient having a disposition to micturate frequently, with bearing down sensations, ardor urinæ, and pain, in a greater or less degree, at the neck of the bladder and along the urethra. In some instances, no blood escapes, in consequence of that which had been effused into the bladder having coagulated, and thus closed the entrance of the urethra. In such cases, there is a feeling of weight and painful distension above the pubes, and the other phenomena are presented which characterize the retention of urine.

The quantity of the blood discharged is altogether indefinite, being often not more than sufficient to tinge the urine, and, in some rare cases, so considerable as to endanger life. Its appearance, moreover, is exceedingly diversified. Sometimes it comes away of a bright-red colour, and nearly or quite pure, especially when the hemorrhage is copious, and afterward coagulates. It may also escape unmixed drop by drop, owing to the blood issuing from the urethra, or the bladder near its orifice. Most commonly it is more or less mixed with the urine, which is sometimes merely tinged by it of a red, brownish-red, or blackish colour, sometimes turbid from the partial coagulation of the blood, which floats at first in irregular flocculi through the liquid, but soon subsides in the form of a soft grumous mass. Occasionally small worm-like coagula are observed in the urine, more or less deprived of their colouring matter. These are supposed to be formed in the ureters. When the blood coagulates in the bladder, its liquid portion first escapes with the urine tinged with the red corpuscles, and afterwards the coagulum broken up into a grumous mass. Thus the urine may continue to be bloody several days after the internal hemorrhage has ceased. Besides blood, various other matters of a mucous or purulent character, and occasionally fetid, are mixed with the urine, in some cases of organic disease of the bladder or kidneys.

The blood may proceed from the kidneys, ureters, bladder, or urethra; but it is not always possible to decide with certainty upon its precise source in particular cases. It may be supposed to come from the *kidneys*, when the hemorrhage has been preceded by pain, heaviness, or other uneasiness in the loins, continued or not along the course of one or both ureters to the groin; when it has followed a blow or fall upon the back; when it is an attendant upon obvious nephritis or other organic disease of the kidneys, or upon calculi in the pelvis of that organ; and, finally, when the blood is mixed intimately with the urine, or presents itself partly in the form of those cylindrical coagula believed to be formed in the ureters. In relation to these coagula, if somewhat bleached, there can hardly be a doubt that they have come from one of the ureters; if soft and of a full-red colour, they may have been moulded in the urethra. The diagnosis of hemorrhage from the *ureters* is almost necessarily uncertain. It may be presumed to exist, when the escape of the blood has been preceded by the very painful passage of a calculus through one of these tubes. It is probably a very rare occurrence, unless in this condition of things; and, even then, it is scarcely possible to be certain that the blood did not proceed from the kidney. The *bladder* is probably the seat of the hemorrhage, when, before or along with it, the patient has experienced uneasiness over the pubes or in the perinæum, or has received a blow or had a fall upon one of these parts; when he is known to have stone in the bladder; when the emission of the blood is attended with symptoms of dysury, and there is no reason to suppose the existence of a large coagulum in the bladder; when, in fine, the blood comes away unmixed or but little mixed with the urine. In cases of malignant fungus at the neck of the bladder, when hemorrhage generally follows the introduction of a sound, the source of the blood may be confidently referred to that organ. When hemorrhage takes place from the *urethra*, it is generally known by the escape of the blood either drop by drop, or in a small stream, without any effort of the patient as in micturition, and without his ability to control the flow except by pressure upon the passage. The blood, too, is usually unmixed; and, when the patient micturates, the urine, though it may be slightly tinged at first, soon passes unchanged; the hemorrhage showing itself again after the cessation of the act. Injury to the urethra, or inflammation of that passage, would also lead to the inference that it might be the source of the blood. Occasionally, however, blood from the urethra, in consequence of a calculus, or of some other obstruction in the passage, flows back into the bladder, and thus tends to confuse the diagnosis.

The course of this hemorrhage is altogether uncertain, depending on the various pathological conditions with which it is associated. Of itself, it is very seldom dangerous, though death has occurred from a profuse loss of blood from the urinary passages, without any discoverable organic lesion. It is not unfrequently serious as a sign of other affections; and is sometimes troublesome and even hazardous by its consequences, as when it fills the bladder and ureters with coagulated blood, and thus obstructs the escape of the urine. The worst form of it is that which attends malignant diseases, and others characterized by a dark, feebly coagulable blood.

A variety of the disease has recently been noticed, in a few cases, in London, distinguished by its intermittent character, the patient being attacked upon exposure to cold with pain in the loins and a discharge of bloody urine, which after a time subsides spontaneously, leaving the urine normal. The recurrence of the attacks is not at any precise interval. The urine is black and turbid, of great specific gravity, and highly albuminous, being readily coagulable by heat; but, when examined by the microscope, though presenting abundance of a dark molecular deposit, is found to contain no blood corpuscles; differing in this respect from ordinary hæmaturia. (*Med. Times and Gaz.*, May, 1865, p. 658.)

Diagnosis.—In certain morbid states of the urinary organs, or of the system, the urine sometimes assumes so nearly the appearance of that mixed with blood, that some care is requisite to distinguish them. Thus, it may be deep-red, or reddish-brown, or blackish, may be turbid, and may deposit a dark sediment somewhat like that produced by blood. In gravel, it is sometimes so concentrated, and so abundant in the reddish salts which mark the predominance of uric acid, that it might without difficulty be mistaken for hemorrhagic urine. It is also reddened by certain kinds of food, as the red beet, the prickly pear, &c., and the same effect is produced by madder. Bloody urine may usually be distinguished by the following properties. It is in general turbid when discharged, and afterwards becomes clear by subsidence; the matter deposited is not dissolved when the urine is heated; the clear portion, containing the serum of the effused blood, is, to a certain extent, coagulable by heat; linen dipped in it is stained of a red colour. On the contrary, the coloured urine above alluded to is often transparent when discharged, and becomes turbid upon standing; redissolves the deposit when heated; is not coagulable; and stains linen yellow, or orange, or brown, but seldom blood-red. The discovery of blood corpuscles by means of the microscope, and of albumen by the usual tests, would be decisive as to the nature of the fluid. The urine of females is sometimes tinged by the menstrual fluid, and by blood from the uterus or vagina; but there can be little difficulty in distinguishing this from the urine of hæmaturia, if the attention of the practitioner be directed to the circumstances of the case.

Causes.—Blows or falls, violent horseback exercise, or the jolting of a rough carriage; violence in severe or protracted labours; venereal excesses; calculi in the pelvis of the kidney, ureters, bladder, or urethra; vascular or varicose tumours in the bladder; certain substances which irritate the urinary passages when taken internally, as cantharides and oil of turpentine;* drastic cathartics which occasion much tenesmus; acrimony of the urine from great concentration, such as occurs in hot climates, where the liquid parts of the blood are carried off by perspiration; translation of gouty or rheumatic disease; suppression of the menstrual, hemorrhoidal, or other habitual discharge; all these, and whatever other causes are capable of inducing irritation and congestion of the urinary organs, may give rise to hæmaturia, especially when, from plethora or the constitution of the blood, there is a predisposition to hemorrhage. When there is a predisposition to this particular hemorrhage, from the state of the urinary organs, anything capable of stimulating the circulation, or giving the hemorrhagic character to the blood, may bring on an attack. Sex and age have some influence in forming such a predisposition; at least it is more common in men than women, and in adults than young children; though the cause of this may be less a peculiar condition of the constitution in the former, than a greater exposure of the parts affected to injurious influences.

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* I have known bloody urine to result from inhalation of the vapours of oil of turpentine. The case was that of a patient in the Pennsylvania Hospital, who had been one of the crew of a vessel loaded with turpentine, among which he had worked and slept for several days. He informed me that two others of the crew were similarly affected. (*Note to the second edition.*)

A variety of hæmaturia, endemic in Egypt and certain localities in South Africa, near the Cape of Good Hope, has been satisfactorily traced to the existence in the system of a species of fluke, the ova of which were detected by Dr. John Harley in the urine of persons affected. (See *note*, *vol.* i. *p.* 151.) According to Dr. Cobold, the Egyptian parasite is the *Bilharzia hæmatobia*; and he has little doubt that the South African species is the same. Medicines are said to have little effect on the disease. (*Medico-chir. Trans.*, 1864, p. 55.)

Pathological States.—Cases of hæmaturia no doubt occur, in which the affection depends merely upon an irritation or congestion of the bleeding surface, connected with a general hemorrhagic predisposition, and without the coexistence of other diseases. But such cases, even including among them those which are vicarious to the menses or hemorrhoidal flux, are very rare; and it is highly probable that a considerable proportion, supposed to be of this character, are actually dependent on some other concealed cause, perhaps a calculus which has escaped detection. The affection with which the hemorrhage is probably most frequently associated is inflammation, with or without ulceration of the mucous membrane. When merely inflammatory, it is seldom considerable; but, when connected with ulceration, it may be copious, though it is not easy nor always possible to discriminate between such cases during life. Bright's disease of the kidneys is often attended with bloody urine. Calculous disorder is a frequent source of this hemorrhage, sometimes by directly wounding the surface with which the concretion is in contact, sometimes by merely irritating or inflaming it. Carcinomatous disease of the parts concerned, generally, at some stage of its progress, gives rise to bloody urine. When the introduction of a catheter is always or generally followed by hemorrhage, this disease may be suspected in the neck of the bladder. Malignant fevers, as typhus, the plague, small-pox, measles, and scarlet fever, and other diseases characterised by a depraved condition of the blood, as scurvy and purpura hæmorrhagica, are sometimes attended with copious hæmaturia of the passive kind.

Treatment.—When not involved in the treatment for associated affections, this should be conducted upon the principles applicable to hemorrhages in general. Rest, abstinence, cooling mucilaginous or other demulcent drinks, bleeding when required by the pulse, and leeches or cups to the loins, hypogastrium, or perinæum, as auxiliary to the lancet or as a substitute for it, when there are signs of decided local irritation, are the remedies applicable to the early stages of active hæmaturia. When the hemorrhage is very copious, ice or ice-water may be applied over the part from which the blood proceeds; when it is moderate, and attended with much irritation, warm fomentations or emollient cataplasms would be preferable. In the former case, cold water, in the latter laudanum, may be advantageously injected into the rectum. I have found great and almost immediate advantage from the acetate of lead, in small and often repeated doses. In the more advanced stages, other astringents, including uva ursi, may often be usefully employed; and oil of turpentine is an excellent remedy in chronic and passive conditions of the disease. The bowels, if disposed to constipation, should be kept soluble by mild laxatives or enemata. It may sometimes be advisable to inject astringent solutions or infusions into the bladder; but this should always be done with caution. When coagulated blood in the bladder obstructs the discharge of urine, or resists the action of that liquid in breaking up and removing it, a sound should be carefully introduced so as to divide the coagulum, or warm liquids thrown up so as to aid in washing it out. In urethral hemorrhage, a bougie may be introduced, after cold, rest, astringents, &c. have failed. In passive hæmaturia, the general rules for the treatment of hemorrhage of this character are applicable; and the same may be said of the prophylactic treatment.

Article IX.

HEMORRHAGE OF THE UTERUS.

Syn.—*Uterine Hemorrhage.—Menorrhagia.*

The term *uterine hemorrhage* embraces all bloody discharges from the uterus, whether dependent on functional or organic derangement, and whether occurring in the impregnated or unimpregnated state of the organ. In this place, however, those only will be considered which are unconnected with gestation; the others being more appropriately treated of in works upon midwifery.

The term *menorrhagia* has a somewhat less extensive signification. Its origin (μήν, month, and ῥήγνυμι, I break) would confine it, in strictness, to an increased flow of the menses; but, as the menstrual discharge is now generally thought to be blood, and uterine hemorrhage, occurring in the unimpregnated state of the uterus, to be a mere increase of the menses, the term is extended so as to embrace that affection. They who consider the menses as a secretion, and not a hemorrhage, make the want of coagulability of the discharge its chief distinctive character. Though the menses usually appear every four weeks, continue for three or four days, and amount, on the average, to about five or six ounces, yet the interval may be much shorter, the continuance longer, and the quantity much greater, without being morbid, or requiring medical interference. No excess beyond the usual average, in any of these respects, would be entitled to the name of a disease, unless productive of injury to the health. Now an excess, to this degree, is very rare without being attended with unaltered and coagulable blood; and Dr. Dewees states, in his work on the diseases of females, that he has known only one instance of the kind. It is, therefore, scarcely worth while to make a distinction between morbidly superabundant menstruation and the hemorrhage which occurs at the same periods; especially as the treatment of the two affections would be conducted upon the same principles. But hemorrhage connected with pregnancy, or dependent upon organic diseases of the uterus, could scarcely be included, with propriety, under the title of menorrhagia, having no relation whatever to the menses. By the term, therefore, is here understood only that form of uterine hemorrhage which occurs simultaneously with the menses, or which, originating from mere functional derangement of the organ, may be considered as somewhat analogous to menstruation in its character.

Menorrhagia has been divided into the active and passive. There is a real foundation for this division, though not recognized by all authors. The difference is simply this, that, in the former, the blood is extravasated in consequence of an irritation or increased action in the vessels themselves; in the latter, flows through unresisting orifices merely upon the principle of gravitation, or under the impulse of the general circulating force. But it does not follow that all cases of hemorrhage attended with general debility are passive; and the probability is, that, in most of the instances in which menorrhagia is so considered, it is really active. Whenever the hemorrhage occurs at certain intervals answering to those of menstruation, and, even under apparently similar exciting causes, does not occur at other periods, it is probably active; for it is only in consequence of a certain vital exaltation or irritation in the organ, that the current of blood is at these times especially directed or invited to the uterus. The general forces which circulate the blood are quite passive in relation to its peculiar direction. Nevertheless, it is important to attend to the strength of the patient; for cases accompanied with debility, even though the uterine action may have the character of irritation, require a very different treatment from those occurring in an opposite state of the system. True passive menorrhagia is that which, in a weakened state of the system and of the uterine vessels, may occur at any time under the influence of exciting causes. It may be the result either of an atonic, relaxed condition of the vascular walls consequent or not upon previous excitement, or of a certain hemorrhagic condition of the blood, which disposes to a passive extravasation, such as takes place in malignant diseases.

Symptoms.—Menorrhagia usually occurs at the regular periods of menstruation, or, if in the interval, at such stated times as to justify the conclusion, that it is in some degree under the influence of the causes which regulate the menstrual function. That this is the case may be inferred also from the fact, that the disease seldom occurs before puberty, or after the age at which the system has become quite accommodated to the abolition of this function. In most instances, various premonitory symptoms are observable, sometimes as much as two or three days before the appearance of the hemorrhage. Such are a feeling of weight, fulness, or heat in the region of the uterus, pains in the loins, bearing-down sensations, slight swelling of the external parts of generation, tumefaction and uneasiness of the mammæ, more or less derangement of digestion, heat of mouth, giddiness or headache, excitement of the pulse, and mental depression. If the hemorrhage occurs at the regular monthly period, the first discharge, according to Dr. Dewees, generally has the characteristic properties of the menstrual fluid, but is soon followed by blood, as shown by the clots or stringy coagula which attend it. The flow of blood frequently relieves the preceding symptoms of turgescence or excitement. After the first gush, it sometimes gradually subsides, and the patient experiences no further difficulty on the particular occasion; but not unfrequently, after partial subsidence, it returns again and again, and does not cease until it has considerably reduced the strength; leaving the patient pale, languid, and with a feeble pulse. Sometimes the hemorrhage is so profuse as to produce a condition of acute anæmia (see *page* 273), and even to involve life in apparent danger. Upon the cessation of the discharge, the patient gradually recovers her strength until the recurrence of the monthly period brings back the same routine of preliminary excitement, hemorrhage, and exhaustion. Occasionally the intervals are not longer than two or three weeks. The general health gradually gives way. The blood becomes deteriorated in quality; and the symptoms of chronic anæmia are at length established. The patient is extremely pale, and suffers much from palpitation, faintness, giddiness, tinnitus aurium, and violent neuralgic headaches. The pulse is feeble, and is rendered very frequent by slight exertion. The returns of the hemorrhage become more irregular, and its duration longer. The discharge of blood is followed by that of coloured serum, and this not unfrequently by a profuse leucorrhœa. The slightest causes are sufficient to induce an attack. At length the patient is scarcely ever free from hemorrhage, which varies only from the extravasation of coagulable blood, to that of a thin, bloody, serous liquid. The general symptoms are still further aggravated. Sallowness of complexion or excessive pallor, great emaciation, a very feeble and excitable pulse, a short and hurried respiration, œdematous extremities, and sometimes a general dropsical tendency, with derangement of the digestive and nervous functions, mark the extreme prostration of the system. Occasional profuse discharges, sometimes attended with syncope, aggravate the danger. If the patient is not relieved, she sinks under the exhaustion, or yields to some accidental disease which her system in ordinary health would have resisted. A fatal termination, however, is rare; as the disease is almost always within the reach of remedies, and the course above described is often cut short, at various points, either by the interposition of art, the cessation of the cause, or the resources of the system.

In some instances, a condition of debility similar to that produced by a long continuance of the hemorrhage, arises from other causes in a healthy condition of the menstrual function. The peculiar causes of menorrhagia, now occurring, superadd this affection. The attacks of hemorrhage, under these circumstances, are less apt to be heralded by premonitory symptoms, and are less regular in their recurrence than in a more vigorous state of system; and the affection speedily assumes the character above described as belonging to the advanced stage. There are, moreover, between the two extremes of vigour and debility, all conceivable grades; so that it is not always easy to decide to which category any particular case may belong.

Either in the induced, or in the original debilitated state of the general health, it is possible that the hemorrhage may assume the truly passive form; the vessels of the womb having lost, to a greater or less extent, their power of resisting the forces that tend to extravasate the blood. But true passive hemorrhagia is probably more frequent as the result of a depraved character of the blood itself, in which it no longer retains the power of supporting the organic contractility of the tissues. In such cases, any cause that may direct the blood with more than usual force, or in more than usual quantity, to the uterus, will bring on a discharge; but the blood, instead of presenting its ordinary appearance, is apt to have a dark colour, and little tendency to coagulate.

Women subject to menorrhagia are less apt to become pregnant, and, when they become so, are more liable to abortion than others not thus afflicted. Dr. Locock has also "frequently remarked that those who have suffered much from menorrhagia, are peculiarly liable to uterine hemorrhage after abortion or parturition at the full time." (*Cyc. of Pract. Med.*, article *Menorrhagia.*) Besides menorrhagia, women are subject to other forms of uterine hemorrhage. Inflammation of the womb is sometimes attended with a considerable flow of blood. The same thing occurs frequently from ulcers of the uterus, and from polypous tumours and other excrescences, which sustain a constant state of irritation and turgescence. Indeed, whenever frequent attacks of uterine hemorrhage occur, at altogether irregular intervals, even during the menstruating period of life, some organic derangement may be suspected, and an examination should be made. Carcinoma of the uterus is almost always productive of hemorrhage. About the period of life at which menstruation ceases, irregularities of this function are very common; and occasional excess of discharge, or even copious hemorrhage, may occur without serious disease of the organ. But, as cancer is apt to be developed about the same time, such hemorrhage is always a subject of suspicion. Should the hemorrhage come on after the menses have ceased entirely, and then occur irregularly, with lancinating pains in the region of the uterus, the grounds of suspicion are much stronger. In all such cases, an examination per vaginam will determine the question.

Causes.—The predisposing causes of this hemorrhage are such as affect the system at large, or operate especially upon the uterus. Among the first are all those calculated to induce a plethoric or otherwise hemorrhagic state of the blood. The causes most operative in the production of plethora in women are, perhaps, sedentary habits, the free use of stimulating food and drink, confinement in hot rooms, and over-indulgence in sleeping, especially in hot beds. A contrary set of causes, as scanty and unwholesome food, bad air, exposure to cold, privations of all kinds, and diseases which impair the digestive functions, sometimes predispose to passive menorrhagia by impoverishing or depraving the blood. The time of life has also some influence. Women appear to be most subject to menorrhagia at the period when the menses, in the natural course of things, are about to cease. Of the causes which act locally, many are occasionally exciting as well as predisposing; in one instance, inducing a tendency to the hemorrhage, and in another, bringing an existing predisposition into action. Such are tight-lacing, habitual constipation, congestion of the portal circulation from disease of the liver or spleen, long-continued leucorrhœa, and the frequent occurrence of abortion. Anything may act as an exciting cause which is capable of irritating the uterus, directly or indirectly, or sending towards it a current of blood. Of this nature are the ordinary menstrual effort, great exertion, inordinate dancing, straining, blows or falls, mechanical violence of all kinds, medicines calculated to affect especially the pelvic viscera, as catharides, oil of turpentine, savine, and aloes, drastic cathartics in general, hardened feces in the rectum, sexual indulgence, lascivious thoughts, exciting passions, piles, and irritating diseases of the bladder and urinary passages.

Treatment.—In acute cases, the patient should be kept at rest in a horizontal position, upon a firm bed or mattress, and carefully guarded against causes of excitement, whether general or local. Everything having a tendency to invite the blood to the uterus, or to confine it there, should be removed. The dress, therefore, should be quite loose; constipation, if existing, should be obviated by laxative medicine or an enema; any irritation of the urinary organs or rectum which may occasion dysury, tenesmus, or bearing-down efforts should be quieted by an opiate injection; and, if there be congestion of the portal circle, dependent on hepatic torpor or obstruction, it should be corrected by an alterative mercurial treatment. These are general directions, to be put in force in all cases presenting the requisite indications. But it is highly important, in conducting the treatment, to consider the state of system, in relation to the degree of elevation or depression.

When the disease is recent, the circulation plethoric, the pulse full and strong, and the evidence of uterine excitement obvious, blood may be taken from the arm. After bleeding, and in cases which do not require the lancet, should symptoms of considerable local congestion of the uterus exist, much good may be derived from a few cups to the sacrum, or leeches over the pubes, to the vulva, or on the inner and upper parts of the thighs. Depletion, however, of this direct character, is comparatively seldom necessary. A saline cathartic to remove any existing constipation, the use of refrigerant or nauseating diaphoretics, rest, cool drinks, and a diet restricted to farinaceous liquids, will generally be sufficient to meet the constitutional indications in active cases. Small doses of tartar emetic or ipecacuanha, repeated so as to induce slight nausea, without vomiting, will often have a happy effect in relieving vascular excitement, and controlling the hemorrhage, while they do not exhaust the resources of the system. Emetics have been recommended; but, though good might result from the relaxation which precedes and follows their operation, there would be some risk of increased hemorrhage, from the straining and consequent compression of the pelvic viscera which attend the act of vomiting. They must, therefore, be looked upon as a doubtful remedy. Should there have been little or no vascular excitement originally, or should it have been subdued, great advantage may be expected from opium and ipecacuanha, given in the form of pill, or that of Dover's powder. Directing powerfully to the skin, this combination acts revulsively upon the uterus, while it quiets the various irritations, general or local, which often so strongly contribute to sustain the discharge. The patient may be kept constantly under its influence by a full dose every eight hours; or it may be administered at night, while other remedies are given through the day. When the stomach is very irritable, the remedy may be administered by the rectum, in twice or thrice the ordinary dose. Tincture of hemp has been found useful by Dr. Maguire, in this form of hemorrhage; and its efficacy is attested by Dr. Churchill, who gives it in the dose of five drops three times a day. Dr. W. H. Dickerson, of London, has obtained extraordinary success in uterine hemorrhage, unconnected with organic disease, from the use of infusion of digitalis. He believes it to act by producing contraction of the uterine fibres through the ganglia of the organ. (*Lancet*, Dec. 8, 1855.)

Should the hemorrhage be considerable, efforts should be made to arrest it directly by producing contraction of the bleeding vessels. This indication is admirably fulfilled by acetate of lead, which may be given in doses of two or three grains every hour, two, or three hours, until the hemorrhage is checked, or until from thirty to forty grains have been taken. It may often be happily combined with the opium and ipecacuanha, and the different indications thus simultaneously answered. If the salt of lead should fail, or be objectionable, recourse may be had to ergot, which is peculiarly adapted to hemorrhages of the uterus, and, in consequence of its sedative action upon the circulation, may be used in cases attended with some excitement. When the hemorrhage is alarmingly copious, it is necessary in addition to employ local measures. Of these, cold is one of the most efficient, and best adapted to this condition of the disease. Cloths wrung out of very cold water or spirit, or bladders containing ice, may be applied about the pelvis, over the pubes, or to the loins and back; the patient may be placed in a cold hip-bath; cold water may be injected into the rectum; or ice introduced into the vagina. Care, however, must be taken that the vital actions, already, perhaps, depressed by the hemorrhage, be not reduced too low by the long continuance of the remedy. Should cold not prove effectual, the measure still remains of plugging the vagina, which in the ordinary state of the uterus can scarcely fail. The following observations upon this point are made by Dr. Locock. "A dossil of lint, or a fine cambric handkerchief may be gradually introduced into the vagina up to the os uteri, so as to fill the vagina firmly throughout its whole extent. Many prefer soaking the material previously in some strong astringent liquid, and this is, perhaps, still more efficacious. If a plug produce pain, it must be withdrawn, and at all events it should not be allowed to remain more than twenty-four hours, because it is apt to become very offensive and irritating from the putrefaction of the discharge. On withdrawing it, unless it be done very gently and gradually, a fresh discharge of blood is apt to be occasioned; but it can easily be restrained by another plug, or some of the other remedies." (*Cyc. of Pract. Med.*, article *Menorrhagia.*) Dr. J. Henry Bennet, of London, in very obstinate cases, plugs the os uteri, instead of the vagina. Bringing the part into view by the speculum, he introduces two or three small pieces of cotton tied to a thread, wedges them firmly into the os uteri, and then covers the cervix with larger pieces before withdrawing the instrument. (*Lancet*, Feb. 1852.)

When the case is originally attended with symptoms rather of general depression than elevation, or when it has become somewhat chronic, and assumed the condition usually considered as passive, other astringents besides acetate of lead may be employed with advantage. Among these, kino, catechu, rhatany, and pure tannic acid, from the vegetable kingdom; and alum, sulphate of zinc, sulphate of iron, tincture of chloride of iron, and sulphuric acid, from the mineral, are perhaps most esteemed. Gallic acid has been strongly recommended; and Dr. T. H. Tanner, of London, has found tincture of cinnamon, in the dose of a drachm, every six hours, very efficacious. (See *Med. Exam.*, N. S., ix. 781.) Others have met with success from the latter remedy, among whom is M. Gendrin. Capsicum has also been recommended, and probably acts in the same manner. The solution of arsenite of potassa is said to have proved useful. Oxide of silver, eulogized by Dr. Lane, has also been employed with great success by Dr. J. J. Thweatt, of Petersburg, Virginia. He gives it in doses varying from half a grain to two grains twice or three times a day, and always combines it with a little opium or morphia. (*Am. Journ. of Med. Sci.*, N. S., xviii. p. 70.) Astringent injections, consisting of alum dissolved in the infusion of kino or catechu, or of solution of acetate of lead, may be thrown into the vagina; and similar injections have even been introduced directly into the cavity of the uterus, by means of a male catheter passed through its orifice, though death is said to have resulted from the latter plan in more than one instance. M. Dupierris, of Havana, Cuba, has found a mixture, consisting of half a fluidounce of tincture of iodine, and a fluidounce of water, injected into the cavity of the uterus, to arrest hemorrhage, without injury to the patient, in more than one hundred cases, with only a single failure. A speculum is employed to bring the os uteri into view, and the liquid is injected by means of a syringe, the end of which is introduced into the cavity of the uterus. The hemorrhage is usually diminished on the following day, and disappears on the third day. If not, the injection may be repeated. (See *N. Am. Medico-chirurg. Rev.*, Jan. 1857, p. 95.)

In cases still feebler, where the system and the uterus are both relaxed, and the hemorrhage appears to be sustained by the relaxation, it becomes necessary, in addition to the measures above recommended for arresting the discharge, to employ others with the view of improving the character of the blood, and invigorating the general organic contractility. These measures are not to be confined to the periods of discharge, but continued also in the interval. The different bitters and chalybeates are now indicated. Sulphate of zinc, in the dose of two grains, and sulphate of copper, in that of one-quarter of a grain, repeated three or four times a day, are occasionally of advantage. The tonics may sometimes be beneficially associated with an aromatic tincture, as that of cinnamon, or of ginger. In old cases, where the uterus is very feeble and relaxed, remedies calculated to stimulate that organ directly have been recommended, such as a blister to the sacrum, aloetic preparations, and even savine and cantharides; but these must be employed with caution. Oil of turpentine has sometimes a very happy effect. M. Beau has employed savine and rue, with much success, in certain cases of uterine hemorrhage at the Charity Hospital, in Paris. He combined the two in equal quantities, giving five centigrammes (three-fourths of a grain) of each, in the form of a pill, morning and evening. (*Ann. de Thérap.*, A.D. 1859, p. 47.) If the bowels are costive, they should be kept open by rhubarb with soap.

The diet should consist of nutritious and easily digestible substances; and the malt liquors, or a little wine may be allowed for drink. A cold bath, or cold hip-bath, may be employed for a few minutes, night and morning, if, upon cautious trial, the system is found to react well under its use. Moderate exercise of a passive kind will sometimes be useful, by improving the l health; but all jolting or jarring, and all active exertion should be ly avoided. Among the most efficacious remedies is a journey to some halybeate springs, and a free use of the waters. The occasions should rably seized for exercise, when the hemorrhage has been suspended. of the good effects of this remedy may be somewhat more safely ob- by means of friction with the flesh-brush.

h may be done, in the intervals of the hemorrhage, to ward off the . The treatment adapted to the period of discharge, in the passive , is generally applicable also to that of suspension; the line between wo conditions being frequently but indistinctly drawn. This treatment n already sufficiently detailed. In active cases, the accession of the hage may sometimes be usefully anticipated by a saline cathartic, and tion of the diet. At all times, in the interval, the diet should be mo- and stimulant drinks avoided. Due activity should be imparted to the ry and nutritive processes by means of exercise, so as to prevent an accumulation of blood in the circulation. All the functions should be ined, as far as possible, in a healthy state; and particular attention be paid to the liver and bowels. In those cases in which the menses tponed beyond the regular time, and are attended with hemorrhage, should be made to bring them back to the proper period. For this e, a warm hip-bath, and copious draughts of warm herb teas may be d to about the regular menstrual period, preceded, if the pulse be full ong, by the loss of a little blood.

l forms and circumstances of the affection, the causes should be care- udied, and, if possible, removed. Hepatic disorder, producing portal con- , is said to favour it, and should be corrected if existing. An irritable f the nervous system, which is apt to attend the complaint, and may ag- e it, should be corrected by such narcotics and antispasmodics as may contraindicated by existing symptoms. Of these, opium or some one reparations is most effectual. Occasion may arise, also, for the use of amus, camphor, assafetida, valerian, and compound spirit of ether.

Article X.

HEMORRHAGE FROM THE SKIN.

ORRHAGE from the skin in a sound state, with the cuticle entire, is ex- gly rare. Cases, however, have been observed. The blood is said to scaped, in some instances, from the whole or large portions of the sur- e sweat; but usually the hemorrhage is confined within a small space, he palms of the hands, soles of the feet, roots of the nails, nipple, navel, ont of the chest, arm-pits, and groins. The blood oozes out like dew he surface, and, if wiped off, reappears in the same manner. The skin h is in some cases quite healthy in its aspect, in others is red, as if con- or inflamed.

 form of hemorrhage is stated to have resulted sometimes from violent n or straining, and from strong mental emotions, especially of fear. But auses could scarcely have induced it without a strong predisposition, de- t probably upon the condition of the blood. It is occasionally vicarious r discharges, healthy or morbid, and particularly to the menses. When is cause, it has been observed to be periodical in some instances. Women ch more subject to it than men.

though exudation of blood through the cuticle is rare, hemorrhage be- the cuticle, and in a morbid state of the skin, is not uncommon. Bleeding from blisters or ulcerated surfaces, and from scratches, or other very slight injuries, often occurs in persons strongly predisposed to hemorrhage; and effusions in the cutis, in the form of petechiæ, and beneath the cuticle in the form of bloody blisters, are common attendants upon scurvy, and other diseases in which the blood is depraved. The consideration of hemorrhage from wounds belongs to the province of surgery. It may not, however, be amiss to mention here that the bleeding from leech-bites, especially those of the European leech, is often profuse, and in children sometimes dangerous, particularly when there is a tendency to hemorrhage.

The treatment in all these cases, so far as regards the cutaneous hemorrhage, is very simple. In many instances, the affection is slight and disappears spontaneously, or subsides with the general disorder in which it had its origin. If so copious or protracted as to demand remedial measures, it may be treated with cold applications, astringent lotions, or compression. When from ulcerated surfaces, those, for instance, of a cancerous nature, from which hemorrhage is frequent and sometimes exhausting, it may in general be readily controlled by the officinal *solution of subsulphate of iron* (*Monsel's solution*), applied gently by means of a hair-pencil to the bleeding point. In the case of leech-bites, I have found a piece of cotton, wet with a saturated solution of alum in boiling-hot water, and then pressed upon the wound just before the salt begins to crystallize, a very effectual remedy. Another plan is to introduce the fine point of a piece of lunar caustic into the bite; and still another, to take a thin piece of caoutchouc, and, having heated it till it becomes soft and adhesive, to press it over the point of hemorrhage, and retain it there until it is firmly fixed.

Article XI.

HEMORRHAGE FROM THE SEROUS MEMBRANES.

This sometimes occurs, though very rarely, as a functional derangement, from causes similar to those which produce hemorrhage from the mucous tissue. It is more common as the result of inflammation. In very many cases of serous inflammation, more or less blood is effused with other liquids; but this scarcely deserves to be considered as hemorrhage. To be entitled to this name, the blood should escape from the vessels in considerable quantities, and with little admixture. This sometimes happens in persons predisposed to hemorrhage; and is a not unfrequent attendant upon pleurisy, pericarditis, and peritonitis, occurring in scorbutic individuals. (See *Scurvy.*) Other sources of hemorrhage into the serous cavities are the bursting of aneurisms, the erosion of blood-vessels by ulceration, and their rupture in consequence of external violence.

Though the effused blood is sometimes in quantity sufficient to produce fatal syncope, it is more commonly injurious by compressing the neighbouring vital organs, or by producing inflammation in the membrane.

The diagnosis in these cases is often obscure; and not unfrequently the affection is first discovered after death. It may be suspected when, without sufficient pre-existing disease to explain the result satisfactorily in another manner, there suddenly occurs great prostration, with the symptoms of acute anæmia; and, at the same time, the functions of some one of the organs invested by a serous membrane are deranged in a mode implying compression. The diagnosis is aided by the fact that, very generally, when there is hemorrhage from a serous membrane, independent of organic disease, there is simultaneously hemorrhage from a neighbouring mucous membrane also; the causes which ccasion the former being so general in their influence as almost necessarily involve a tissue, so much disposed to this affection as the mucous. If, by the id of percussion or auscultation, a fluid can be discovered in one of the serous vities, the evidence is strengthened.

These hemorrhages are not necessarily fatal. If the effused blood is not ry copious, it coagulates, and, producing inflammation in the contiguous embrane, occasions the exudation of coagulable lymph, which may form an rganized cyst around the mass, and ultimately remove it by absorption. Or e coagulum may itself become organized, and form a new structure not in- mpatible with the life of the patient. Art has little to do in such cases but look on, and occasionally aid the efforts of nature by correcting derange- ents in the general health. Should the symptoms afford reason to think that e hemorrhage is still going on, and that it may be the result of an irritative sudation, it would be proper to endeavour to check it by bleeding, carried far as the strength of the patient will admit; and, if he be already reduced o far for this remedy, cold may be applied externally, as near the seat of the morrhage as possible. When the effusion is very abundant, nothing offers chance of safety but the evacuation of the blood through an artificial open- g; and the chance from this source is very slight.

Hemorrhage of the *pleura* is one of the most frequent of the serous hemor- ages. It may be suspected when shortness of breath, great debility and intness, and bloody expectoration occur suddenly and simultaneously; while e chest affords, by percussion and auscultation, evidences of a liquid within e pleura, not previously existing there. It is generally fatal when conside- ble. Paracentesis has been performed in cases attended with large effusion, t not with very encouraging results. Dr. Karawagen, of Kronstadt, per- rmed the operation in four cases of hemorrhagic pleuritis, attendant on an pidemic scurvy which prevailed at that place in 1839, and in all with relief the patients, though without ultimate success.

Effusion of blood into the *pericardium*, when it occurs, is generally conse- uent on rupture of the heart or one of the large blood-vessels; but cases have een recorded in which it appeared to be the result of transudation; as no so- ution of continuity could be found upon the most careful examination. Such ases have come under the notice of Baillie, Chomel, Carson, and Burrows. In homel's cases, the affection continued several days, and was attended with rthopnœa, an unequal and irregular pulse, the absence under the hand of any pulse of the heart, general œdema, and reddish expectoration. (*Dict. de Méd.*, v. 173.) Dr. Karawagen performed the operation of paracentesis in two ases of hemorrhagic pericarditis, accompanying scurvy, in one with relief to e symptoms, in the other with complete success, the patient having ulti- ately recovered; and this was the only case of recovery out of thirty affected ith the disease. Three pints and a half of bloody liquid were extracted. See *Med. Examiner*, iv. 525) The same operation has been frequently per- rmed by Dr. Kyber. In most cases, it merely served to protract life with- t preserving it; but, in four, a radical cure was effected. (See *Ranking's bstract*, vii. 64.)

Hemorrhage of the *peritoneum*, independent of inflammation or organic isease, though rare, has been occasionally noticed. Sudden and very severe bdominal pains, nausea and vomiting, coldness of the surface, extreme feeble- ss of the pulse, a haggard countenance, and delirium have been the promi- ent symptoms. The presence of blood in this cavity, whether from transu- ation or other cause, is probably less fatal than in the pleura; isolation, and ltimate absorption, organization, or elimination of the blood, being of occa- ional occurrence.

The phenomena and effects of hemorrhage of the *arachnoid* will be detailed under diseases of the brain and spinal marrow. As to the *tunica vaginalis testis* and the *synovial membranes*, little need be said. Hemorrhage in these membranes is almost always the result of violence, though it may sometimes occur from transudation in persons of a strong hemorrhagic diathesis. Blood has been found effused into the joints in scurvy.

Article XII.

HEMORRHAGE OF THE AREOLAR AND PARENCHYMATOUS TISSUES.

EXTRAVASATION of blood in the *areolar* or *cellular tissue* is a common result of a general predisposition to passive hemorrhage. In scurvy, purpura, and malignant febrile affections, as well as in cases of constitutional predisposition, it is among the most constant phenomena. The extravasation takes place immediately under the skin, forming ecchymosis; beneath the mucous and serous membranes, producing elevated red patches in parts obvious to inspection; and among the muscles, giving rise to tumours, often of considerable size. In short, there is no portion of this tissue in which the effusion may not occur. The blood in these cases, if the patient survives the disease in which the hemorrhage originates, is either gradually absorbed, or becomes organized, and forms new structure, which ultimately disappears. The hemorrhage itself is seldom an object of treatment; the efforts of the practitioner being directed towards the general affection.

Effusion of blood in the areolar tissue is a frequent result of external violence, and, in persons with a constitutional tendency to hemorrhage, is produced by the slightest causes. Large ecchymoses and bloody tumours are thus occasionally formed under the skin. They almost always, however, disappear gradually by absorption, if not tampered with. Evaporating lotions, as tincture of camphor, may sometimes hasten the process; and it is possible that gentle pressure may occasionally do good, though it must be used with caution. If attended with inflammation, they should be treated with cold water, or saturnine lotions.

Hemorrhage into the *tissue of organs* is of no unfrequent occurrence, though it probably results much oftener from an inflammatory or other organic lesion, or from external violence, than from mere transudation consequent upon irritation or congestion. It sometimes attends upon affections characterised by a hemorrhagic state of the blood. In most of the organs its existence can be known only after death. In the lungs and brain, however, it occasions characteristic phenomena which indicate it in many cases with sufficient clearness. It is almost never by the mere loss of blood that it does harm, but by interfering with the functions of the organ. In this way it is almost always serious, and very often fatal. Apoplexy and palsy result from such effusions in the brain, and pulmonary apoplexy in the lungs. (See *Apoplexy*, and *Hemorrhage of the Lungs.*)

SECTION V.

DISEASES OF THE ORGANS OF SECRETION.

section might embrace all the diseases of all the secreting tissues, in-
the serous, cellular, and mucous membranes, the skin, and the con-
te glands; but many of these are more conveniently considered under
actions, in the execution of which the tissues perform an essential
, for example, the complaints of the alimentary mucous membrane
gestion, and of the bronchial under respiration. I shall treat here
the diseases of the serous and areolar tissues, the skin, the salivary
he liver, the spleen, the kidneys, and the appendages of these several
No arrangement of diseases can be so precise that the different di-
rill not occasionally trench upon one another.

SUBSECTION I.

DISEASES OF THE SEROUS AND AREOLAR TISSUES.

isequence of the connection of these tissues with other functions than
story, all of their diseases are considered elsewhere, except dropsy,
eing generally a disease of secretion, would appear to fall naturally
division.

Article I.

DROPSY.

r may be defined to be a morbid accumulation of watery or serous
he areolar tissue or serous cavities. A certain portion of such fluid
ial to the healthy state of these parts. It is only when the wants of
se are exceeded, and an accumulation takes place productive of more
iconvenience or injury, that it can be said to be morbid, and thus to
a dropsy. Nor do I here include, under this term, the serous collec-
it sometimes take place in mucous cavities, in cysts or hydatids, or
the bursæ and synovial sacs. Though there is a certain analogy be-
ese and dropsy, and though the name is not unfrequently applied to
ey differ in this respect, that they are generally quite local, and do
dropsy, depend upon causes which may produce a simultaneous effect
e ordinary seats of the affection. Thus, we may have serous effusion
areolar tissue, the peritoneum, and the pleuræ, at the same time, and
same cause; but this does not extend into the mucous or encysted
and seldom to the joints. The affections usually originate under
circumstances, obey different laws, and require different treatment.
a most convenient to separate certain cases of effusion in serous cavi-
the general category, and either to treat of them under the head of
ins which they severally affect, as when the discharge is a mere at-
upon inflammation, or to refer them to the surgeon, as in the case
icele. The only localities of dropsy here considered are the areolar
ie arachnoid, the pleuræ, the pericardium, and the peritoneum. When
ion takes place in the areolar or cellular structure, it is denominated,

if extensive, *anasarca*, if limited to one part, *œdema*; when it affects the arachnoid, it is called *hydrocephalus*, or *dropsy of the brain*; when the pleuræ, *hydrothorax*, or *dropsy of the chest*; when the pericardium, *hydropericardium*, or *dropsy of the heart*; when the peritoneum, *ascites*, or *abdominal dropsy*. The name of *general dropsy* is given to the affection when it occupies all or most of these positions, to a greater or less extent, at the same time. The complaint will be first treated of in its general relations, and afterwards in the several localities alluded to.

Dropsy is rather a symptom or result of morbid action than itself a disease. Nevertheless, it usually holds this rank in practical treatises, and, from its own striking characters, and the frequent obscurity of the true pathological condition in which it originates, will probably always continue to do so. The danger in which it frequently involves life, and the consequent necessity of employing measures for its removal, without reference to its source, are other considerations which entitle it to a place in the catalogue of distinct diseases.

Pathological Condition.

The first inquiry in relation to dropsy should be directed towards the pathological condition upon which the liquid accumulation depends, and which constitutes the true disease. This is not the same in all cases. Very different, and, indeed, opposite derangements of function or structure are the sources of dropsy. They may all be included under the following heads.

1. *Irritation, Active Congestion, or Inflammation.*—The serous and areolar tissues pour out an increased quantity of fluid when excited. The excitement may amount to inflammation. That dropsical effusion is sometimes associated with this condition of the membrane from which it proceeds, is evinced by the symptoms during life, and the results of examination after death. Pleuritic and abdominal pains with fever occasionally precede hydrothorax and ascites; and, in some cases of anasarca, pressure upon the edematous part occasions considerable uneasiness. Indeed, inflammation of the serous tissues is generally attended with a fluid exudation, a portion of which has the serous character. When this is speedily absorbed, after the subsidence of the acute symptoms, it is not considered dropsical; but if it continues long, and especially if it increases and becomes complicated with external œdema, it is unhesitatingly admitted to that rank. Dissection after death, in such instances, often exhibits decisive evidence of pre-existent or persisting inflammation. In most cases, the inflammation is chronic; and it is not unfrequently complicated with tubercles, which serve to sustain it. But, though inflammation sometimes lies at the foundation of dropsy, the disease is more frequently the result of mere irritation with vascular turgescence. The very act of effusion relieves the vessels, and inflammation is prevented by the occurrence of dropsy.

2. *Debility or Relaxation.*—An opposite condition of the tissues to that just mentioned may be productive of the same result, in relation to dropsical effusion. The vessels in debility sometimes become so relaxed, that the more liquid portions of the blood are allowed to pass through their walls, almost without resistance. We observe the same thing in the vessels of the skin by which the watery part of the blood is often poured out abundantly in very feeble states of the system, in the form of colliquative sweats. The results of injection after death confirm this view of the pathological condition in certain cases of dropsy. Dr. Horner, late Professor of Anatomy in the University of Pennsylvania, stated that, in fine injections of whole dropsical subjects, scarcely any resistance is offered by the blood-vessels; the injected fluid escaping from them by their lateral porosities as fast as it can be thrown in. (*Am. Journ. of Med. Sci.*, i. 265.)

1. *Passive Congestion.*—Distension of the blood-vessels, unattended with ation, frequently results in serous effusion. If water be injected into the of an animal in considerable quantity, death takes place with symptoms rebral and pectoral oppression, and watery fluid is found, upon dissec- in one or more of the serous cavities, and in the areolar tissue. If, pre- y to the injection, blood has been abstracted, and the quantity of water yed be merely sufficient to supply the loss, the same consequences do not w. Distension, therefore, is the immediate cause of the effusion. Such ion frequently occurs, in various degrees, from a derangement of the balance between absorption and secretion, and from other causes. It y when considerable, or, from the nature of its cause, lasting, that dropsy duced. It may be said that the distension produces irritation or in- action of the capillary vessels, and that the effusion is the result of an process. This is no doubt often the case; but frequently also there is to believe that it is wholly or in great measure passive, as all evidences citement are wanting; and the effusion is most apt to take place when blood is watery, and the tissues relaxed. It is not improbable that many are of a mixed character; the extravasation being ascribable partly to tion, partly to mere mechanical transudation.

preternatural fulness of the blood-vessels may be general, affecting the circulation, or it may be confined to the venous system, or to some por- of it, as to the portal circle, for example, or to a single limb. When , it is apt to be the result of some impediment to the return of the ve- blood. The character of such impediments will engage our attention, the causes of dropsy. The extent and position of the dropsy will of be influenced by the locality of the congestion.

Altered Condition of the Blood.—There is little doubt that an altered osition of the blood is occasionally the true pathological condition in y. What is the precise nature of the change has not been certainly de- ed. It is well known that anemic patients are occasionally attacked by y; and it has been supposed that a watery state of the blood favours ccurrence of the disease. In repeated instances, examination of anemic ts who have died of dropsy has detected no organic lesion whatever, to the disease could be ascribed; and a fair inference is that the blood in fault. Two such cases are recorded by M. Castelnau in the *Archives rales* (*4e sér.*, v. 141). According to Andral, the dropsical tendency is ected not with a deficiency of fibrin or red corpuscles, but of albumen in blood. (*Patholog. Hæmatology*, Am. ed., 108, &c.) MM. Andral and Ga- always detected albumen in the urine, in dropsical cases in which they a deficiency of that principle in the serum. (*Arch. Gén.*, *4e sér.*, v. 168.) accounts for its deficiency in the blood, without the necessity of admitting this deficiency was the cause of the dropsy. Dr. Rees, in many exami- ons of the blood of dropsical patients, never discovered a diminution in proportion of albumen. (*Ibid.*, 169) In the two cases detailed by M. Cas- , there was no albumen in the urine, and the inference is drawn by the hor that it was not wanting in the blood, which was very watery and defi- t in red corpuscles. Watery blood may, therefore, cause dropsy without special deficiency of albumen; but there can be little doubt that such a de- cy really does contribute to the dropsical tendency. The fact is, that fur- experiments are required to decide what is the precise alteration in the blood h disposes to dropsy. In the present state of our knowledge, we can only that it is in general apparently more watery than in health. How it is that state of the blood induces effusion is equally uncertain. It may be that the ter tenuity of the liquid facilitates its escape through the pores of the ca- llaries; it may be that these pores themselves become relaxed from the want of due stimulus from the blood; or, finally, both these causes may operate. It is highly probable, also, that accumulation in the blood of urea and other unhealthy constituents, consequent upon diminished secretion of urine, may give rise to an irritant property in the circulating fluid, which, acting on the serous and areolar tissues, may occasion increased secretion, and thus cause dropsy.

An affection, known in the East Indies by the name of *beri-beri*, appears to be nothing more than dropsy connected with a depraved state of the blood, which, according to Dr. Morehead, is of a scorbutic character. The prominent symptoms are general weakness and indisposition to exertion, followed by pain, numbness, and stiffness of the limbs, anasarca, effusion into the serous cavities, epigastric uneasiness, and not unfrequently, in the advanced stages, vomiting often repeated, and sometimes with discharges of blood. The disease runs its course in two or three weeks, or a shorter period, and often proves fatal. (*Ranking's Abstract*, xxii. 42; from *Trans. of Med. Soc. of Bombay*, 1855.)*

5. *Deficient Absorption.*—In health there is a constant exhalation from the serous and areolar tissues, and an equally constant absorption of the effused fluid; and the two processes so far balance each other that no injurious accumulation takes place. It is obvious that dropsy may arise from an irregular condition of either or both of these functions; from an excess of exhalation while absorption remains unchanged, from a deficiency of absorption, exhalation continuing as in health, or from an increase of exhalation and diminution of absorption combined. No sufficient proof has been adduced that dropsy depends exclusively on deficient absorption. It has been inferred to do so from the fact, that obstruction of the absorbent vessels is sometimes followed by œdema of the limb below; but this is not a necessary consequence; for even the thoracic duct has been found obstructed without giving rise to dropsy. Nor has it been shown that the action of the absorbents is at all diminished in most cases of the disease. On the contrary, rapid loss of flesh often attends the progress of dropsy; and the lymphatics running from dropsical parts have been sometimes observed to be greatly enlarged, as if they had been more than usually active. Besides, we have no proof that the fluid exhaled in dropsy is identical with that exhaled from the same tissues in health; and the probabilities are that it is not so; for albumen, which is found in dropsical fluid, is not usually a constituent of the normal secretions. But it is now generally believed that the veins are concerned in the process of absorption. Obstruction in these vessels, by producing congestion in the venous radicles below, must prevent the admission of fluid from without, and thus interfere with absorption, so far as the veins are concerned. The experiments of Magendie would appear to place this fact beyond doubt. They demonstrate that, when the venous system is artificially distended by the injection of water, absorption is impeded greatly, if not quite arrested. It is highly probable, therefore, that a deficiency of absorption in consequence of congestion of the veins is one of the pathological conditions upon which dropsical accumulations depend; but it is equally probable that this is never the sole, nor even the original cause; for, in all such cases, effusion is greatly increased in consequence of the distended state of the vessels. The fact, before stated, of the enlargement of the lymphatics in such cases, goes to show that absorption is not diminished in the ratio of the increased effusion; a portion of the duty of the veins being performed by the absorbents, which thus labour, though not in all instances effectually, to remedy the inconveniences arising from the venous congestion.

The pathological conditions, above enumerated, are all that occur to me as being the immediate sources of dropsical accumulations. They constitute the me diseases of which the dropsy is a symptom. It is certain that various organic or functional derangements not yet mentioned are remotely the source of dropsy; but they all act by inducing one or more of these conditions, and will be more appropriately considered under the head of the causes of the disease. Two or more of the above conditions are often united. Thus, irritation may supervene upon a watery condition of the blood, and congestion of the vessels; and it will be readily understood that, in such cases, the liability to the affection must be much greater than when either of the morbid states exists alone. We can thus explain why, in frequent instances, one of these states appears without dropsy, while in other instances, being reinforced by one or both of the other conditions, it is attended with the complaint.

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* For an elaborate essay on this affection by MM. Fonssagrives and Le Roy de Méricourt, Professors in the Naval School of Medicine at Brest, the reader is referred to the *Archives Générales* for September, 1861, p. 256. (*Note to the sixth edition.*)

Symptoms, Course, Termination, &c.

The symptoms which characterize dropsical effusion will be more conveniently detailed under the particular forms of dropsy. The affection sometimes comes on suddenly, with more or less febrile action, indicated by increased frequency and force of pulse, warmth of skin, furred tongue, &c. Sometimes it is gradual in its approach, advances slowly, and is associated with general debility, and depressed rather than excited vascular action. In the former case it is sometimes called acute or febrile dropsy, in the latter chronic. But there is no definite line of demarcation between these varieties. Dropsy with feeble action sometimes makes its attack suddenly, and cases characterized by excitement may be slow in their progress; while others beginning with febrile action may end in debility. It is important that the practitioner should be aware that the disease is attended with these different states of the system; but little good can result from any attempt at classification on such a basis. Cases of excitement sometimes manifest obvious marks of inflammation, such as thoracic and abdominal pains in hydrothorax and ascites, and tenderness of the areolar tissue on pressure in anasarca. More generally, however, the local symptoms are those rather of irritation than of inflammation. In dropsy with debility, the skin is usually very pale, the pulse feeble, and the general condition of the patient not unfrequently anemic. In many instances, neither symptoms of excitement nor of depression are very obvious.

The urine is almost always scanty. In this, dropsies of whatever character, and from whatever cause, generally agree. It is not, however, always easy to determine exactly what constitutes scanty urine. The quantity of this secretion varies exceedingly in different persons, and in the same person under different circumstances, and within the limits of health. The average in twenty-four hours, in healthy individuals, may be stated at two or three pints. In dropsy it is often not more than a pint in the same time, and sometimes is much less. In some rare cases, the urine remains undiminished, or is even increased, especially in the advanced stages. These are generally cases of debility, in which the serous portion of the blood finds a ready outlet through the relaxed vessels, whether of the kidneys, or of the serous or areolar tissue.

The character of the urine is variable. In different cases it is deep-brown like beer, deep-red and lateritious, bloody, bilious, pale, light-yellow or reddish, turbid, somewhat opalescent, limpid, and quite healthy in appearance. In febrile dropsy, it is generally dark-coloured and turbid, more or less albuminous, and of a specific gravity less than in health. In cases dependent on disease of the liver, it is often very high-coloured and bilious, and is said to have the odour of honey. In renal cases, it is sometimes dark-brown or tinged with blood, generally more or less acrid and albuminous, and often abounds with epithelium thrown off by the tubuli uriniferi of the kidneys, and not unfrequently contains fibrinous casts of the tubes, discoverable by the microscope. Since the publication of Blackall's work on dropsy, considerable attention has been paid to albumen as a constituent of urine; and the determination of its presence or absence, and relative quantity, is considered important as an aid to diagnosis. The subject has acquired additional importance from the researches of Dr. Bright and others. It will be treated of more extensively, when we come to the consideration of renal disease as a cause of dropsy. It will be sufficient here to point out the modes by which the presence of albumen may be detected.

Tests of Albumen in the Urine.—One of the most convenient tests is *heat.* The urine, if turbid, should be first filtered, and, if alkaline to test paper, should be neutralized; as alkalies counteract the coagulating property of heat, and, moreover, sometimes occasion a precipitation of the earthy phosphates in urine when heated, though it may contain no albumen. The urine should also always be examined before it has had time to undergo decomposition; as the albumen may be changed along with the other principles, and thus no longer be sensible to the usual tests. When prepared for examination, the urine may be exposed in a glass tube, closed at one end, to the flame of a spirit-lamp, or simply heated in a silver spoon, or other convenient recipient, over the fire. According to the proportion of albumen present, will be the amount of insoluble matter produced. If it be very small, there will be a mere whitish cloudiness in the urine; if larger, there will soon be a sensible precipitation of whitish, curdy flakes; if very large, the whole mass of urine may gelatinize. The last result is rare. The proportion of the precipitate varies, from the smallest appreciable quantity, to a bulk which occupies nearly the whole of the fluid.

Another test usually employed is *nitric acid.* This added to albuminous urine produces a flaky precipitate. But it cannot be relied upon alone, as it sometimes, in the absence of albumen, occasions a precipitation of uric acid, and sometimes of nitrate of urea, when this latter principle is in excess in the urine. Such precipitates, however, are redissolved upon the application of heat. It has before been stated that heat may cause a deposition of the earthy phosphates in alkaline urine. These are redissolved upon the addition of nitric acid. Thus it appears that these two tests separately employed are liable to fallacies; but conjointly their evidence may be considered certain. They should both be tried in every case at all doubtful. According to Dr H. Bence Jones, the presence of a little acid may prevent the coagulation of albumen by heat; as a compound of the acid and albumen, though insoluble in dilute acid, is soluble in a large proportion of pure water, hot or cold. He therefore advises that, before this test is tried, the tube should be washed thoroughly clean. (*Lancet*, March 16, 1850.) Additional proof is afforded of the albuminous nature of the urine, if acetic acid should not precipitate the coagulum produced by heat and nitric acid, when dissolved in solution of caustic potassa. It may be proper to observe that albumen, in very minute proportion, is capable, when coagulated, of rendering a clear liquid turbid, and that its bulk after precipitation is greatly disproportionate to its weight. Dr. Christison never found more than 27 parts in 1000 of urine, and states that, in the proportion of one part in 100, it gives to the urine almost the appearance of a thin pulp. When in considerable proportion, it coagulates at 160°, but if much diluted requires the heat of boiling water.

Perspiration is generally deficient in dropsy. The *bowels* are often costive, and sometimes very insusceptible to purgative medicine, even of the most powerful kind. In some cases, however, the disease is complicated with chronic intestinal inflammation; and then the patient is apt to be affected with diarrhœa. When this occurs without any amelioration of the dropsical symptoms, and especially in the advanced stages, or when dropsy supervenes during its prevalence, it is usually an unfavourable sign.

Thirst is often a prominent symptom. It is not confined to the febrile form of the disease, but may attend the most feeble cases.

The fluid effused in dropsy appears generally to consist of the serum of the blood, more or less altered. Though not absolutely identical under different circumstances, it usually possesses closely analogous properties, being, for the most part, limpid, colourless, or slightly yellowish, and without smell. It is occasionally tinged with blood, especially when the dropsy is dependent on obstruction of the veins. In cases of inflammation, it is sometimes milky, and contains flakes of coagulated matter, and may also be mixed with pus. Its specific gravity is variable, but always exceeds that of water. It consists chiefly of water, but contains various principles existing in the blood. Albumen is almost always present, but in very different quantities. In sixteen cases examined by Andral, he found proportions varying from 4 to 48 parts in 1000 of the fluid, and uniformly less than in the serum of the blood. The proportion was greatest in those cases in which the health appeared least impaired. Besides albumen, Marcet found, in variable proportion, a peculiar animal principle which he named muco-extractive matter. Urea was found in large proportion by Dr. Corrigan in the fluid of a case of ascites with symptoms of diseased kidneys. (*Dub. Journ. of Med. Sci.*, March, 1842.) M. Delaharpe, of Lausanne, discovered fibrin in several instances, in the fluid of abdominal dropsy, in such quantity that the liquid coagulated after being withdrawn. (*Arch. Gén.*, 3*e sér.*, xiv. 174.) According to Marcet, the salts are in singularly uniform proportion, in whatever part the fluid is effused. They consist of chlorides of sodium and potassium, sulphate of potassa, soda either free or carbonated, and phosphates of lime, iron, and magnesia.

The dropsical effusion may occupy any one of the serous cavities, or any portion of the areolar tissue, whether in the interior of the body, or beneath the skin. Gravitation, and consequently the position of the patient, have much effect in determining the position of the fluid, whether in the cavities, or the areolar tissue. In the latter, the communication between the cells allows it to traverse the body with little difficulty. Hence, the swelling in anasarca is usually first observed, and is greatest in the feet, ankles, and legs. Hence, too, in the areolar tissue of the lungs, the effused fluid generally occupies the lower portion, in consequence of the erect position of the patient.

The disease is confined to no time of life. It is not unfrequent in infancy, is frequent in old age, and occurs at all intervening periods. It is, however, most common towards the decline of life. It occasionally undergoes a spontaneous cure. In such cases, the disappearance of the effusion is generally coincident with an increase of some one or more of the secretions; with the occurrence, for example, of a profuse diuresis, perspiration, or diarrhœa.

Most of the disagreeable symptoms, in the progress of the complaint, arise from the deranged functions of the various organs, consequent upon the pressure of the effused fluid. Its greatest danger is from the same source. Thus, respiration and the action of the heart are embarrassed from the pressure of liquid in the thorax; and convulsions, coma, palsy, and apoplexy occur from a similar cause within the cranium. Œdema of the glottis sometimes occasions the most serious consequences. The pressure of the distending fluid in the extremities not unfrequently occasions inflammation of the skin, terminating in gangrene, and ultimate exhaustion. More frequently, however, the fatal result in dropsy is owing to the organic diseases in which it originates, as those of the liver, kidneys, and heart. Inflammations, such as pleurisy, bronchitis, and gastro-enteritis, not unfrequently occur in the advanced stages and carry off the patient. In some instances, the effused fluid is entirely absorbed towards the close, and the patient dies exhausted, when the inexperienced practitioner might be indulging the hope of a favourable issue.

Causes.

I consider as causes of dropsy those which produce the several pathological conditions upon which the effusion depends. In the first place may be mentioned all those capable of inducing irritation or active congestion of the secreting tissue. Of these one of the most common is exposure to cold, especially in a state of profuse perspiration. If, in this condition, the kidneys, from excess of excitement or other cause, fail to perform the vicarious office that is thrown upon them, the irritation may be directed to the serous or areolar tissue, and dropsy result. In general, however, inflammation rather than dropsical irritation ensues; and, in order to the production of the latter, there must be a peculiar predisposition, consisting either in the state of the blood or of the capillaries, or in some other and unknown condition. Somewhat similar in their effect to cold, are the retrocession of cutaneous eruptions, or of gouty and rheumatic irritations, and the suppression of accustomed discharges, whether healthy or morbid, as of the urinary and menstrual secretions, hemorrhoidal flux, &c. The condition of system which follows delivery is said sometimes to favour the occurrence of dropsy, probably in consequence of a want of due accommodation of the general excitement, incident to the pregnant state, to the new order of things. Pregnancy itself may sometimes produce dropsy, as an effect of its attendant vascular fulness and excitement, in cases where a predisposition to the disease exists. Certain febrile diseases, especially the exanthemata, often leave behind them a tendency to that sort of irritation of tissue which occasions dropsy. The same is not unfrequently the case with protracted intermittent fever; though, in this instance, the pathological condition is probably rather an anemic state of the blood, or venous congestion from disease of the liver and spleen, than vascular irritation. The presence of tubercles in the tissues affected is another cause of dropsical irritation, and one of those least capable of being obviated.

Secondly, in the catalogue of causes may be ranked those which operate by relaxing and debilitating the tissues, and impoverishing the blood. These are frequently coincident. Among them are insufficient or unwholesome food, insufficient clothing, habitual exposure to damp, cold, and impure air, impaired digestion, excessive secretion, great loss of blood, the intemperate use of alcoholic drinks, and long-continued and exhausting diseases, as irregular gout, scrofula, cancer, and scurvy. Dropsy is often the closing scene of such affections, and its occurrence may generally be regarded as a sure evidence of the breaking up of the constitution. The abuse of mercury is said sometimes to have produced dropsy; but I have not witnessed this result It has been already stated that protracted intermittents may rank in this class of causes. Chronic disease of the spleen is very frequently associated with the anemic state of the blood so favourable to dropsy, and very probably contributes to it. From what has been said before, it will be inferred that whatever favours the escape of albumen by the kidneys, and diminishes that ingredient in the blood, may predispose to dropsy.

Still another, and probably the most frequent set of causes, are those which obstruct, or in any way retard the return of the blood by the veins, and thus occasion venous congestion. These may act on portions of the venous system, or on the whole. Simple debility may, to a certain extent, operate in this way, by retarding the returning current of blood from depending parts. It will be apt to do so if aided by posture. Long standing sometimes induces dropsical effusion in the lower extremities of feeble individuals. Pregnancy, uterine tumours, and enlarged ovaries are thought to produce the same effect, by pressure on the veins. Anasarca occurring in the advanced stage of pregnancy is looked upon by some as indicating a disposition to puerperal convulsions.

Inflammation and consequent obliteration of the veins themselves occasion serous effusion in the parts from which the blood is conveyed by them; and, when the great trunks are the seat of the affection, the dropsy may be very extensive. Organic diseases of the liver and spleen, and of the heart, act in a similar manner, and are among the most frequent causes of dropsy. The same result has been ascribed to obstruction in the lungs, impeding the flow of blood from the right to the left cavities of the heart. Some of the English writers consider dropsy as a not unfrequent result of pulmonary inflammation, whether of the bronchial membrane, or the parenchyma; and there can be no doubt that the affections are sometimes associated. It may be a question, however, whether they are not the mere effects of a common cause. One would suppose that dropsy must be a frequent result of those chronic pectoral affections, in which, either from a loss of substance or consolidation of tissue, free scope is not given for the passage of the blood of the pulmonary arteries. We should say *a priori* that the right side of the heart, and consequently the whole venous system, must become congested, and dropsical effusion follow; but this result really happens much less frequently than might be imagined, probably because, in these chronic affections, the mass of blood is diminished, so as to correspond to the diminished capacity of the lungs. Emphysema of the lungs is more frequently than other pulmonary affections followed by dropsy; because the general condition of the system is comparatively little impaired, as much or nearly as much blood is required as in health, and, the lungs being unable to transmit the whole with due rapidity, a general venous plethora takes place. Compression of the heart and of the great veins, by large dropsical collections in the serous cavities, is thought sometimes to induce anasarca by impeding the return of blood from the various parts of the body.

Besides the above causes, disease of the kidneys and of the lymphatics is yet to be mentioned. The first is among the most common, and has of late years attracted great attention. There will be occasion to recur to it directly. Of the latter, it is only necessary to say that dissection, in cases of dropsy, has sometimes shown the lymphatic glands, especially those about the great vessels, enlarged and indurated; and that a diseased condition or extirpation of the glands in the groin or axilla has been followed by œdema of the corresponding extremities; facts which tend to show that obstruction in the absorbents may be a cause of dropsy; but much more frequently the glands are found diseased, or have undergone extirpation without any such result.

Before closing the subject of the causes of dropsy, it will be convenient to consider certain forms of the complaint in reference to the diseases in which they have their origin; as the nature of the connection, in these cases, gives rise to pathological peculiarities of greater or less importance in a practical point of view. The forms alluded to are, of dropsy following fever, and those depending on intestinal, hepatic, cardiac, and renal disease.

Scarlet Fever as a Cause of Dropsy.—The form of dropsy which follows scarlet fever does not seem in any degree connected with the grade of the previous disease. The mildest cases are probably as often succeeded by dropsy as the most severe, and, judging from my own observation, more so. It would seem that the poison had not been completely eliminated in these mild cases, and remained to exert an irritant influence upon the serous and areolar tissues, and on the kidneys, as before upon the skin. There is no regular period at which the dropsical symptoms appear. Sometimes they occur almost immediately after the cessation of the fever, sometimes as late nearly as a month. Perhaps the most frequent period is from ten to twenty days after the occurrence of desquamation. It has been supposed that the dropsy is induced by the action of cold upon the delicate skin. This may be true to a certain extent, though my own observation would not have led me to this conclusion.

[illegible] is not amiss, to avoid exposing a patient, during or im- [illegible]mation, unnecessarily to the cold air.

[illegible] most frequent form of the disease; but effusion not unfre- [illegible] into the serous cavities. The complaint is usually [illegible] an accelerated pulse, furred tongue, diminished appetite, [illegible] constipation of the bowels. Occasionally it is attended with [illegible] meningitis, or of thoracic inflammation. Headache, flushed face, [illegible] contracted pupil, heaviness, stupor, convulsions, and palsy mark dif- [illegible] the first affection; pain in the chest, cough, dyspnœa, irregu- [illegible], and sometimes great oppression, indicate the second. Both [illegible] complicated with effusion before their close, and, if neglected in their [illegible] stages, are highly dangerous. Either the pleura, or the pericardium, or [illegible] be affected. The peritoneal cavity is also frequently the seat of [illegible] But the most constant pathological condition, and the one upon [illegible] the affection probably in chief depends, is active congestion or inflam- [illegible] the kidneys. Evidences of this are presented not only upon post- [illegible] examination, but also by the condition of the urine during life, which [illegible] highly albuminous, and often bloody, and, when inspected by the [illegible] the microscope, exhibits abundance of epithelial cells and cylindrical fibrinous casts of the uriniferous tubules. Indeed, in any case of convalescence from scarlet fever, when the urine is albuminous and materially diminished in quantity, dropsy may be apprehended. More will be said in a subsequent paragraph, and under the head of Bright's disease of the kidneys, of the influence of morbid states of this organ in producing dropsy.

The anemic state in which the system is sometimes left after severe scarlatina favours the occurrence of dropsy, and occasionally this cause co-operates with the renal affection in producing the disease. The dropsy following scarlatina, in the great majority of cases, yields readily to judicious treatment.

Miasmatic Fever as a Cause of Dropsy.—One of the most common sources of dropsy, in this country, is the state of system following our ordinary intermittent and remittent fevers, and especially the former. These affections often leave the system extremely anemic, with a condition of the blood highly favourable to serous transudation. The copious night-sweats which occur under those circumstances are familiar to every practitioner. I have often found the urine in the ensuing dropsies highly albuminous; though it is by no means invariably so. The albumen, thus drained out by the two emunctories, becomes deficient in the blood, and the condition most favourable to dropsical effusion takes place. Any cause which represses the action of the kidneys and skin may now determine the production of the disease. The visceral disease consequent upon these fevers is probably another source of the dropsy. Enlargement of the spleen is very frequent, and seems to be in some way connected with the impoverished condition of the blood, not improbably, indeed, as one of its causes. Disease of the liver operates in a manner explained further on. The dropsy following intermittents and remittents is most frequently anasarcous, though sometimes general, and, when the liver is especially involved, abdominal. It will almost always get well under judicious management.

Dysentery as a Cause of Dropsy.—Chronic ulcerative affections of the bowels, whether coming under the denomination of diarrhœa or dysentery, but especially the latter, are frequently associated with dropsy in their advanced stages. Not unfrequently bowel complaints come on in the course of renal dropsy, and are sometimes extremely obstinate, and tend much to embarrass the treatment. But it is not to these that allusion is here made. There may be no special predisposition to dropsy, and no disease which is at all likely to end in it. In this condition of the system, an attack of dysentery may occur, which shall run on to a chronic form, and at last give rise to anasarca, with or without effusion into the peritoneum. The dropsy is the result of the dysentery, and of that alone. It is probably by inducing an impoverished state of the blood, through interference with the digestive process, that the latter disease acts in producing the former. If, under these circumstances, the bowel affection can be removed, the dropsy will get well spontaneously with the improvement of the blood, or will readily yield to remedies.

Disease of the Liver as a Cause of Dropsy.—Disease of the liver may give rise to dropsy in two ways. The enlarged viscus may press upon the ascending vena cava, and diminish its caliber so as to produce venous congestion in all its ramifications. In this case we should probably have anasarca and ascites together. The same condition of the liver may lessen the caliber of the vena portarum and its branches; or changes in its interior structure, without enlargement, may interfere with the capillary circulation of the same set of vessels. In either of these events there will be congestion of the whole venous system of the abdomen, and ascites may result. When obstinate abdominal dropsy exists, with yellowish conjunctiva, sallowness of the skin, and a jaundiced urine, without any sensible enlargement of the liver, there may be reason to apprehend scirrhus, cirrhosis, or extensive tuberculization of that organ. It is more frequently found enlarged in dropsical affections of hepatic origin than otherwise. This does not prove that the diseases which augment the volume of the liver are more apt to occasion dropsy than those which derange its interior structure without enlarging it; but only that they are more common. Cases of the former kind are, in general, more easily curable; because the hepatic affection itself, being frequently chronic inflammation, more readily yields to remedies. Dropsy does not generally occur as a consequence of hepatic disease, until the latter has been of long continuance. It is, therefore, very frequently attended with debility. The urine is scanty, high-coloured, and often bilious, but, unless when the hepatic disease is complicated with the morbid state of the kidneys, is not albuminous.

Disease of the Heart as a Cause of Dropsy.—Organic disease of the heart, whether seated in the valves, or in the muscular tissue, very frequently results in dropsy. The effusion is ascribed to congestion arising from irregularity in the circulation. Constriction at the valvular openings, by checking the current of blood, causes it to accumulate in the vessels behind; and inaccurate closure of the valves may cause the force of the heart's impulse to receive a direction contrary to nature, and thus similarly to retard the current. Let us take, for example, disease of the left auriculo-ventricular valve. If the orifice is narrowed, the onward flow of blood in the pulmonary veins is impeded; the resistance is propagated through the capillaries to the ramifications of the pulmonary arteries, the right ventricle is thus overloaded and consequently enlarged, and the whole venous system becomes congested. If, on the contrary, the valve does not close accurately, the force of the ventricle is exerted on the pulmonary veins, and the same evil consequences are extended through the capillaries to the pulmonary arteries, the right ventricle, and the veins of the body generally. An undue activity arising from hypertrophy, or feebleness from dilatation, in one of the sides of the heart, must of course disturb the equable distribution of the blood, and congestion in one portion or another of the circulation must ensue. But this mechanical explanation of the agency of the heart in producing dropsy may be carried too far. Due weight should be given to the influence of a constantly excited circulation in developing irritation of the tissues. There can be little doubt that hypertrophy of the heart sometimes produces dropsy in this way. Besides, a watery condition of the blood is a very frequent accompaniment of dilatation and other organic derangements of the heart, whether as cause or effect; and very probably contributes largely to the production of dropsy in these cases.

There is nothing in the character of the dropsy itself, which will serve as a means of diagnosis between this and other cases having a different origin. In every instance of dropsy not obviously traceable to a different source, the heart should be suspected, and its condition examined. If it be found to have been long organically affected, the inference will be justifiable, that it has been mainly instrumental in the production of the disease; though it not unfrequently happens that other causes have co-operated, as hepatic or renal affections, or an anemic condition of the blood; and in some instances, probably, the heart is wholly innocent; for dropsy is by no means a constant or necessary consequence of its organic diseases.

As might be concluded from the nature of its cause, dropsy of cardiac origin is usually general. Commencing with anasarca, which for the most part shows itself first in the lower extremities, and gradually extends over the whole body, it invades also the serous cavities, and sometimes even the areolar tissue of the lungs, giving rise to protracted and complicated suffering, from which, though the patient may be temporarily relieved by treatment, he is generally in the end rescued only by death. The disease is seldom attended with active inflammatory symptoms. The urine has been sometimes observed to be albuminous in cases which, after death, have exhibited no signs of renal disease; but in general it is not coagulable.

Disease of the Kidneys as a Cause of Dropsy.—Whatever disables the kidneys from secreting a due amount of urine may occasion dropsy. Debility, irritation or congestion, inflammation, and disorganization of various character, may have this effect. The excess of liquid in the blood-vessels, not escaping, as usual, by these organs, seeks another outlet, and, if the perspiratory function be now arrested by cold or other cause, it finds this outlet sometimes through the serous and areolar tissues. But diseases of the kidneys of different kinds, even to the extent of complete disorganization, may, and frequently do exist, without giving rise to dropsy; and the particular circumstances which occasion the complaint to be developed in one instance, while in others of a similar character, so far as the kidneys are concerned, no such result is experienced, have not been clearly ascertained. Some advance, however, has recently been made towards a solution of the difficulty.

Under the name of Bright's disease, certain organic affections of the kidneys have, within a few years, attracted much attention, as being very frequently associated with, and probably the cause of dropsy. Of the nature of these affections, a particular account will be given hereafter. (See *Bright's Disease*.) It will here be sufficient to say that there are at least two distinct renal derangements which have been confounded under the title just mentioned; one a peculiar desquamative inflammation of the tubuli uriniferi of the kidneys, and the other a fatty degeneration of the same structure, both of which have the effect of interfering with the secretory function of the organ, and thus diminishing the quantity, and altering the quality of the urine. One of the most prominent of the changes in the urine is the abnormal presence of albumen. So characteristic has this symptom been supposed to be, that, when it has been observed in dropsy, some have been inclined to believe that it afforded sufficient evidence of a renal origin of that affection. Observation, however, has shown that albuminous urine is not invariably present in Bright's disease, that when it occurs, it is not invariably attended with dropsy, and that it is frequently met with in dropsy and other affections independently of any known disease of the kidneys. Indeed, cases are on record of death from dropsy with albuminous urine, in which no disease of the kidneys could be detected by post-mortem examination. The action of mercury is said to be sometimes attended with coagulable urine. I have repeatedly seen it in anasarca, consequent upon intermittent fever, in which there was no reason to suspect ieys. It is said sometimes to occur under the influence of blisters from ides. It will, of course, be found whenever blood exists in the urine, derived from the kidneys, or the urinary passages. It occasionally in pregnancy; and, finally, it is asserted that albuminous urine has served in health. The association, therefore, between Bright's disease kidneys, albuminous urine, and dropsy is not essential. Nevertheless, frequent that there must be some bond of connection between them, lationship of cause and effect, which it is desirable to understand. It n supposed that the dropsy might be the cause, and the renal derange- effect. But this cannot well be; as the latter often precedes for a rable time the dropsical effusion. It has been said that the dropsy is ient merely upon the diminished flow of the urine; and this may have fect in producing it; but it cannot be the sole cause; for in the ad- stages of the kidney disease, the quantity of urine sometimes exceeds lthy average. The probability is that, in consequence of suspended and obstruction in the uriniferous tubules, produced in a manner which explained under Bright's disease, the return of blood from the Mal- bodies is impeded, congestion of these bodies is induced, and the se- rtion of the blood escapes, if not the blood itself, in consequence of gestion. Hence the albuminous and often bloody urine. The blood, hus deprived of a considerable proportion of its albumen, becomes itery and tenuous, and escapes more readily through the exhalant pores rous and areolar tissues. Another highly probable cause of the dropsy tention in the blood of the urea and other substances, which the kid- w cease to eliminate in due proportion, and which probably stimulate etory function of the different dropsical tissues.

important to be able to form a correct diagnosis between dropsies ng on this affection of the kidneys, and those proceeding from other This can generally be done by exercising an accurate scrutiny into circumstances of the case. The dropsy is almost always anasarcous beginning; and, throughout, though one or more of the serous cavi- y become involved, there is generally a predominance of the areolar . The complaint is very seldom indeed confined exclusively to the abdomen. The absence of any other known source of the disease end to fix suspicion upon the kidneys. If the heart, lungs, and liver und; if intermittent or remittent fever had not immediately preceded ction; if it had not occurred suddenly from exposure to cold, the g of some wonted secretion, or the retrocession of a cutaneous erup- , finally, it could not be traced directly to debilitating causes, such as of blood, the scorbutic diathesis, or the long prevalence of exhaust- eases; there might be strong reason for referring the origin of the int to the kidneys. This would be greatly strengthened by the previ- urrence of accidents, which might be supposed to affect the kidneys, blows upon the back, or by the previous existence of symptoms, which e immediately referred to these organs, as dull or acute pain in the region. If consequent on scarlet fever, the complaint may generally red to the kidneys, as at least one of its sources.

the evidence afforded by the urine is most to be relied on. This is n the beginning, and is always diminished when acute symptoms super- on those of the chronic form of the complaint. In the advanced stage, e stated, it is sometimes natural in quantity, or even in excess; and, if dition of urine exists without the use of diuretics, and at the same time psical symptoms increase or remain undiminished, the presumption is though by no means positive, that the kidneys are affected. The urine n relation to colour, the presence or absence of turbidness, the disposition to deposit a sediment or otherwise, as in other forms of dropsy; and sometimes it is not unhealthy in either of these respects. One striking character, however, not so frequently observed in other cases, is the presence of blood, which sometimes merely tinges the urine, sometimes appears as a dark reddish-brown or blackish deposit. This bloody state of the urine is especially common in the earlier stages, and acute forms of the complaint. A disposition to froth readily, and the unusual permanence of the froth when produced, resulting from the presence of albumen, have also been observed.

From what has been before said, it will be inferred that the mere fact of the coagulability of the urine by heat or nitric acid is not in itself sufficient proof of the renal origin of the dropsy. Taken in connection, however, with the foregoing circumstances, it would go far to establish the fact; and, if the albuminous impregnation persist for a long time, or show itself in large quantity, the evidence may be considered as almost conclusive. But the most decisive proof is that afforded by the microscope, which, by the detection of epithelial cells of the uriniferous tubes and fibrinous casts of the same, gives indisputable evidence of desquamative inflammation of the kidneys, or, by showing the existence of cells containing oil, indicates fatty degeneration of those bodies.

Much importance has also been attached to the specific gravity of the urine as a diagnostic character. This is almost invariably diminished in Bright's disease. The sp. gr. of healthy urine, according to M. Solon, is from 1·[illegible] to 1·024. In the complaint in question, it is gradually reduced as the disease advances, being at first little different from health, and sinking, in the last stages, as low as 1·008, and sometimes even much lower. Solon, in one instance, observed it as low as 1·003, but states the mean at 1·013. But, in drawing inferences from the specific gravity, reference must be had to the amount secreted; for the elimination of water by the kidneys may be increased without a corresponding increase of solid matter. The larger the quantity of the urine, the less will be its specific gravity. When, therefore, the quantity and specific gravity sink together, the evidence is strong of a morbid state of the kidneys. The reduction of the specific gravity has no direct relation to the presence of albumen. On the contrary, the albumen is in general most abundant early in the disease, diminishes with its progress, and is sometimes entirely and permanently wanting before its close. It also not unfrequently disappears for a time, and fatal cases have occurred in which it has never been observed. In such instances, the specific gravity assists much in the diagnosis. If, for example, the urine in dropsy contain no albumen, or but little, and have at the same time a low specific gravity, the presumption would be in favour of the existence of the kidney affection. If, having been coagulable, it should cease to be so, and, instead of reacquiring the healthy density, should remain light, or become lighter, the quantity not being increased, there would be evidence that the disease of the kidneys, so far from having yielded, was persisting and probably advancing.

A necessary inference from the diminished specific gravity of the urine, even when albumen is present, is that the other solid constituents are below the average in health. This has been ascertained by experiment to be actually the case. The quantity of urea and of saline matter, which constitute the chief solid constituents of healthy urine, has been found to be greatly reduced; according to Dr. Christison to one-fifth, and sometimes even as low as one-twelfth; the urea and saline matters being diminished in about the same proportion. The average quantity of urea in healthy urine is stated at three or four per cent., of saline matter at two or three per cent. It has been observed that, when the urea diminishes in the urine, it may sometimes be detected in the blood, where no trace of it can be found in health; so that the result is not owing to a conversion of this principle into albumen; but simply to the t it is not separated by the kidneys from the circulating fluid, and is wed to accumulate in the latter. Under the same circumstances, it found in the dropsical fluid of the serous cavities. The blood, while gains urea, loses a portion of its albumen and red corpuscles; and equently a strongly anemic condition is at length established. Hence, a sallow or dingy paleness of complexion, which is often a striking of this variety of dropsy.

is nothing very peculiar in the character of the dropsical symptoms, eir progress. When the disease of the kidneys is acute, the anasarca appears at an early period; and, even in its more chronic forms, the cement of the effusion, or its increase, is apt to be coincident with the ation of inflammation or febrile excitement. This form of dropsy is ly liable to be complicated with symptoms of cerebral derangement, headache, drowsiness, stupor, delirium, paralysis, apoplexy, and con-. They come on usually towards the close of the complaint, and are the most frequent modes of its fatal issue. It has been observed that d diminution, or even total suspension of the secretion of urine, gene-cedes their appearance. They are sometimes probably owing to drop-sion within the encephalon, as evinced by their occasional coincidence increase of the general dropsy, and by the discovery after death of the ventricles, and in the tissue of the pia mater. But, in some in-no such effusion is detected; and the cerebral affection must be ascribed ltered state of the blood, consequent upon the diminished secretion of Another frequent complication of renal dropsy is internal inflamma-st commonly of the serous membranes, and especially of the pleura. ry much increases the danger of the complaint, and is probably often ediate cause of death. Organic disease of the heart is also frequently ed with the affection of the kidneys; whether as cause or effect, or as lt of some common cause, has not been determined. The same is the ough less frequently, with organic disease of the liver. Indeed, it is ely that the alteration of the kidneys is found, upon dissection, uncom- with other morbid structural changes.

nformation upon various other points connected with this renal affec-e reader is referred to the disease of the kidneys. I have aimed at ring it here only in its connection with dropsy. No age is exempt is variety of dropsy, though it is most common in adults. Men are bject to it than women. In its early stages it is often curable; but always be regarded as a formidable disease; and, when the structural ment of the kidneys has become considerable, though the dropsical ms may disappear, a restoration to health can scarcely be expected.

Prognosis.

erous cases are on record of the spontaneous cure of dropsy; and M. re, as well from observation as from the result of his researches into lical annals, has come to the conclusion, that such a termination of the is not very rare. (*Arch. Gén.*, 3e *sér.*, xiv. 461.) Sometimes the cure udden, being effected in the course of a few days, and even a few hours. ral it appears to be the result of a great increase in one of the normal ns; as, for example, of urine, of perspiration, or of the intestinal fluids. es are cited, in which profuse vomiting of serous fluid has speedily protracted cases; and the crisis by diarrhœa is not uncommon. M. re relates a number of cases in which the critical discharge was from which would be considered less probable; as from the salivary glands, al or vaginal mucous membrane, and even from accidental secretory . Dr. Watson relates a case, in which hydrothorax was greatly relieved by the copious expectoration of a limpid fluid. The tendency to exhalation, instead of taking an external direction, is sometimes thrown upon another internal part, and a sort of metastasis of the dropsy takes place. Thus, the swelling may suddenly leave the extremities, and symptoms of compressed brain or lungs come on, in consequence of effusion into the ventricles or into the pleural cavities. In some instances, the dropsy has been known to disappear without any increased evacuation whatever.

Dropsy very often also yields readily to remedies. Within my own experience, it has very generally proved curable when not dependent on tuberculous inflammation of the tissues affected, or upon organic disease of the viscera, as the heart, liver, and kidneys. Even in these cases, the dropsical symptoms will often disappear under appropriate treatment, and, if at the same time the organic affection be cured, will not return. Thus, permanent cures are not unfrequently effected of ascites dependent on chronic inflammation and engorgement of the liver; and the same is true of renal dropsy, in the earlier stage of the affection of the kidneys. Occasionally, even when the original disease remains, and marches steadily onward towards a fatal issue, the dropsy, after having been removed by treatment, does not again make its appearance. But much more frequently, under such circumstances, it returns and constitutes one of the greatest sources of distress to the patient towards the close of his life. Sometimes it may be removed, and will return several times, before it finally gets the mastery; and, where the physician cannot cure, he can often do very much to relieve. The great difficulty which he encounters is, that finally the strength of the patient gives way, and he is then precluded, even though he may call in the aid of supporting treatment, from the use of those evacuating remedies upon which he has previously relied.

Treatment.

In a disease so various in its origin and character, no one plan of treatment will be generally applicable. The remedies must necessarily be adapted to the particular circumstances of each case. Nevertheless, there are certain indications which should always be kept in view. These are, 1. to correct, as far as practicable, the particular pathological condition upon which the effusion may immediately depend; 2. to remove by absorption, or otherwise, the effused fluid; 3. to remedy any disease, whether cardiac, hepatic, or renal, which may act as the remote cause of the dropsy; and 4. to support the strength of the system, when this may be necessary, under the exhausting influence of the disease, or of the medicines employed. The same remedy will often answer more than one of these objects; and, where two or more remedies are required, they may very generally be given conjointly; so that, in detailing the treatment, the several indications cannot be exactly followed, without ceaseless repetition. They will, however, be borne in mind in the succeeding observations, as they always should be in practice.

When there is reason to believe that the effusion is the result of an inflammatory or highly irritated condition of the exhaling tissue, and the general symptoms are those of active febrile excitement, or, even in the absence of fever, should the pulse be full and strong, blood-letting may sometimes be employed with much benefit. It not only diminishes the secretory irritation, and thus checks the effusion, but disposes to the absorption of the effused fluid, according to the well-established principle, that the fulness of the blood-vessels and the activity of absorption are in an inverse ratio to each other. The amount taken must be regulated entirely by the condition of system. If the patient is vigorous, and the pulse full and tense, from twelve to eighteen ounces may be taken at first, and the operation repeated once, or oftener, under similar circumstances. This remedy is sometimes adequate alone to the cure of dropsy.

cases are few which require or will support copious depletion, and ore frequently the remedy is not only not called for, but strongly conated. The plan of promoting absorption, in all cases, whether in a s or debilitated state of system, by the frequent repetition of small s, while, in cases of debility, the general strength is supported by rich d strong stimulants, is, I think, highly objectionable; for, though it eve the patient for a time, it will be apt to leave him still more disto the disease than at first, with the additional disadvantage of a susity more or less worn out by needless stimulation. It is well known ment losses of blood have been the cause of dropsy, by inducing anæt is only, therefore, in cases presenting a decided elevation in the grade al action, and an unimpaired state of the general forces, that bleeding sible. A buffy state of the blood, under these circumstances, will fae repetition of the remedy, as marking the existence of inflammation. of the same general character as those above alluded to, with little or sed activity of the circulation, it would be safer, as a general rule, to the refrigerant diuretics and hydragogue cathartics without bleeding; ng employed only when clearly indicated. When the disorder of the ssue assumes the grade of inflammation, it will generally be proper, tion to the depletory measures mentioned, to apply cups or leeches to nity of the affected part. Of these two remedies, cups are usually pres most effective. They may be applied to the chest or abdomen when vities are diseased; and will sometimes be found useful to the temples of the neck, when stupor or other evidence of determination to the exhibited. Blisters are also useful under similar circumstances. Should mmatory action refuse to yield to these means, recourse may be had mel and opium, pushed to a moderate affection of the gums.

, instead of irritation of the secreting tissues, we have relaxation or with an impoverished condition of the blood, perhaps a scarcely less pathological condition than the former, a wholly different treatment red. The indication now is to improve the condition of the blood, tone and increased contraction to the tissues. For this purpose, the tions of iron, and those of Peruvian bark, are, upon the whole, the cient remedies. Five grains of the pill of carbonate of iron, of the harmacopœia, conjoined with sulphate of quinia, may be given three times a day; and it will often be found convenient to unite in the same y diuretic or alterative medicines which the case may require, such as gitalis, calomel, or the mercurial pill. The preparations of iron may d to meet the circumstances of the case. The tincture of chloride of d the solution of the iodide would seem to be peculiarly appropri they add diuretic to their tonic and astringent properties. Nor e practitioner confine himself to the tonics mentioned. Almost any f the class may be used, if any particular circumstance in the case seem to call for it. The pure bitters are much employed. Among the s occasionally resorted to is the decoction of pipsissewa, which is at e time mildly tonic, astringent, and diuretic, and is admirably adapted cases of this kind, requiring a gentle impression very long continued. moss has also been commended. To fulfil the same end of improving dition of the blood, a diet of the most nutritious and digestible anid should be recommended, and porter or ale may be given for drink.

pathological condition which consists in passive venous congestion may plicated with one or the other of the above conditions, or may present ptom of either, and, so far as the system is concerned, must be treated ngly. When there is no evidence of excitement, and none of debility ia, we may leave the general state of health out of the question, and address our remedies to the removal of the cause of congestion, and the promotion of absorption. In every case, we should endeavour to ascertain whether any obstruction to the circulation exists in any portion of the veins, and, if discovered, to remove it.

Conjointly with attention to the general condition of the system, whereby we may check the disposition to excessive exhalation, we should endeavour to fulfil the second indication, that, namely, of removing the effused liquid. This is done most effectually by promoting the secretions. We thus diminish the amount of circulating fluid, and proportionably favour absorption. At the same time, the tendency to exhalation is incidentally diminished; and, if inflammatory excitement of the tissues exists, it is relieved by the depletion effected, and by a revulsive direction of excitement from the seat of disease to that of the stimulated function.

Diuretics.—The symptoms strongly invite attention to the secretory function of the kidneys, as the one which especially demands stimulation. The urine is almost always scanty; and the progress of the effusion not unfrequently bears a close and direct relation to its diminution. To increase the action of the kidneys would, therefore, seem to afford a probable chance of relieving the disease; and experience has abundantly confirmed the deduction. No remedies, upon the whole, prove more effective in the cure of dropsy than diuretics. When they can be brought to act freely, the disease is almost always moderated, if not removed. Of the diuretics, I have, within my own experience, found bitartrate of potassa, or cream of tartar, most successful. When no organic visceral disease or tuberculous deposition has been at the root of the malady, and when the strength of the patient has been sufficient to hold out under the continued use of the remedy, I have generally been able to cure dropsy by this diuretic, with or without adjuvants, according to the apparent requisitions of the case. But, in order to produce the greatest effect, it must be given properly, and in sufficient quantity. Attention is frequently not paid to the comparative insolubility of the cream of tartar, and the patient takes only the liquid which may have been directed as the vehicle, leaving most of the medicine at the bottom of the vessel. Many practitioners content themselves with directing half an ounce or an ounce to be taken at one dose, every day or every other day. The medicine thus given acts as a purge, and, being removed from the bowels, is not absorbed, and consequently does not reach or affect the kidneys. A better plan is to direct a certain quantity of the salt to be added to a pint of water or other vehicle in a bottle, and the whole to be taken, in wineglassful doses, at certain intervals, in the course of twenty-four hours; the caution being always strictly observed to shake the bottle thoroughly before pouring out the dose, and then to swallow this quickly before the salt has had time to subside. The quantity must vary with the case, and if, upon trial, that first employed should make no impression, it should be gradually increased until it operates actively upon the kidneys. Half an ounce in the course of the day will, in some rare instances, be sufficient; but much more frequently it will be necessary to increase to an ounce, an ounce and a half, or even two ounces, in the same period of time. If the patient should be much purged, it may be proper to administer a little laudanum occasionally, so as to check the alvine discharges, and give the remedy a direction to the kidneys. Should dyspeptic symptoms be induced, they may often be counteracted by employing as a vehicle for the salt, instead of water, an infusion of juniper berries, or wild-carrot seed, which are at once gently stimulant and diuretic; and some aromatic, as cardamom, fennel, or ginger, may be added if circumstances seem to require it. When, however, such additions are made, the infusion should be separately prepared, and strained before being used as a vehicle; as, if the salt and its adjuvant be mingled to-in infusion, the whole of the former cannot be taken without swallow- solid residue of the latter, and much of it, therefore, is left in the ves- Should the dyspeptic symptoms continue notwithstanding these means, am of tartar should be omitted for a time, and afterwards resumed if d advisable. I have given these somewhat minute directions from an ence of their usefulness, and the disadvantages which often accrue from eglect. It has been stated above that, in all cases of dropsy not de- nt on visceral disease or tubercles, nor complicated with too great de- a cure might be hoped for from this remedy. I believe it to be pecu- adapted to cases in which the pathological condition is inflammatory ion of the exhaling tissue. But even in the exceptional varieties of above mentioned, the cream of tartar, though it may not effect a per- t cure, will often produce great relief, and not unfrequently cause the te disappearance, for a time, of the dropsical effusion. The only cases ch it is positively contraindicated are those of great debility. If the th of the patient, no matter what may be the form of the disease, should rved to give way under the continued use of the salt; and if the addi- employment of sulphate of quinia, with a nutritious diet and malt , or a little wine, should fail to counteract its debilitating effects, it e omitted altogether.

ious other saline diuretics are employed with more or less success. g them nitrate of potassa probably ranks next in efficacy to the bitart- Like that salt, it is especially indicated in inflammatory or febrile dropsy; ing even more sedative in its general influence, and more apt to induce irritation, it is applicable to a less extensive range of cases, and should used when there are evidences of debility, or any suspicion of inflam- of the stomach. It is generally employed as an adjuvant to other more it remedies, though in some instances of itself sufficient to cure the dis- Little good, however, can be expected from it unless freely given. Until y, fears have been entertained of its poisonous operation in large quan- It has, however, been ascertained that, if sufficiently diluted with wa- may be administered safely in doses much beyond those formerly thought . As a remedy in dropsy, not less than two drachms should be given nty-four hours. This quantity should be dissolved in at least a pint of or of some mucilaginous or diuretic infusion, and given in doses of from twenty grains at suitable intervals.

tate of potassa was formerly thought so efficient in its action on the kid- s to have received the name of *sal diureticus*, or diuretic salt. It is ratively little used at present. The same may be said of soluble tartar ochelle salt, both of which have had some repute in the cure of dropsy. are not without effect, but have given way to the more diuretic salts mentioned. Carbonate and bicarbonate of potassa are still occasionally ed sometimes with benefit. They are peculiarly advantageous in cases ed with excess of acid in the primæ viæ, or in the urine; and will gen- correct the lateritious sediment in that secretion, denoting the presence tes. Though less effective as antacids than the corresponding salts of hey are better adapted to dropsy by their greater diuretic power. They advantageously associated with bitter tonics, such as quassia or co- , when these are indicated. Such combinations have repeatedly proved te to the cure of dropsy. The bicarbonate is preferable to the carbo- consequence of its milder taste.

ill is an active diuretic, much employed in this disease. It is in fact the remedies in which the profession have the highest confidence. Being hat stimulating, it should not be given in febrile and inflammatory and it usually fails when the urine is strongly coagulable. It is moreover unsuited, in consequence of its nauseating and emetic properties, to cases of irritable or inflamed stomach. Under all other circumstances, it may be employed with the hope of benefit. It is considered by Blackall as peculiarly useful in dropsy of the chest, with scanty, high-coloured, and uncoagulable urine, which deposits a sediment on standing. In the dose of two grains, two or three times a day, in which it is commonly recommended, it will often entirely fail of effect. This may be a suitable dose to begin with, but it should be quickly increased, either in quantity or frequency of repetition, until it produces decided nausea. As this effect is desirable merely as a test of the activity of the medicine, the dose should be somewhat reduced after it has been attained, and subsequently kept just within the nauseating point. I have often found it necessary to give two grains every two hours, before any decided effect could be obtained. If it purge, it should be combined with a little opium. Calomel is often most advantageously associated with squill, in cases which demand at once diuresis and the mercurial influence.

Digitalis is another most valuable remedy in dropsy. Though it occasionally fails in materially increasing the flow of urine, yet in many cases it operates with great power, producing and sustaining a copious diuresis, and completely eradicating the complaint. A knowledge of the circumstances favourable to its action would be very desirable; and various attempts have been made to indicate the cases to which it is peculiarly adapted. Dr. Withering, to whom the profession is mainly indebted for its introduction into regular practice, was of the opinion that it was better adapted to patients of feeble constitution, with a pale complexion, lax fibre, and edematous limbs pitting easily on pressure, than to the vigorous and florid, with a strong pulse and firmness of limb. It has also been stated to prove peculiarly efficacious in the dropsy of intemperate individuals. Dr. Blackall found it most successful in cases attended with coagulable urine, especially when the secretion was scanty, high-coloured, bloody, or disposed upon cooling to deposit a branny or lateritious sediment. He considered it an almost certain remedy in the anasarca following scarlatina, when the urine is albuminous, and no fatal disorganization of parts exists. The same author thought caution necessary in its use, in cases attended with pale and copious urine, even though coagulable. This condition of the urine indicates frequently an advanced stage of organic disease of the kidneys, in which few remedies can be of service, and the system, already greatly debilitated, might easily be prostrated below the point of reaction. Dr. Blackall states that, when it operates favourably, the urine becomes gradually less coagulable; and that, even when it removes the swelling, unless it occasions this change in the urine, it produces no permanent good. My own experience has been to a considerable extent confirmatory of the observations of Dr. Blackall. I have met with much more success from the remedy in cases attended with albuminous urine than in others. Two instances of general dropsy of this kind are prominent in my recollection, in which, after a long continuance of the disease, and the fruitless employment of a great variety of means, complete success followed the use of digitalis. Its beneficial influence, however, is by no means confined to such cases. In dropsy depending on disease of the heart, it often affords great relief; and it may be resorted to in any case in which the system is not too far worn out by organic disease, or the vital actions too feeble from other causes to resist so potent a sedative. Any tendency which digitalis may have to purge should be counteracted by opium, which is also a useful adjuvant, in some instances, by obviating the sedative effects of the remedy, without interfering with its diuretic action. The best mode of administering it is in substance or infusion. A tablespoonful of the officinal infusion, in which a drachm of the leaves is employed to nine fluidounces of menstruum, though it is the dose usually directed, much exceeds in amount a grain of the powder, which is the usual dose in the latter form. It would be best to begin with only one-half the quantity, repeated twice or thrice daily, and to increase it gradually until some symptoms of its action are observed. The dose may in this way be augmented to ten or fifteen grains, or its equivalent. In whatever form or quantity digitalis is employed, its effects should be closely watched, and the appearance of a decided impression of any kind should be the signal for a suspension of the remedy, or a diminution of the dose. Great increase of the urinary secretion, reduction in the frequency and force of the pulse or intermissions in its beat, nausea and vomiting, purging, faintness, giddiness, and a tensive pain of the head, sometimes over one eye, as noticed by Blackall, are among the signs of the action of the medicine which should not be overlooked. The tendency which digitalis has to accumulate, and, after having been given for some time without apparent effect, to break forth suddenly from its quiescence into violent action, must also be borne in mind. The dropsical patient to whom this remedy is administered should, as a general rule, be visited by his medical attendant every day. Powdered digitalis has also been employed externally. MM. Brera and Chrestien, of Montpellier, have succeeded, by friction with the powder upon various parts of the body, in bringing on copious and salutary diuresis. (*Dict. de Méd.*, xvi. 84.)

Tobacco has properties closely resembling those of digitalis, and like it occasionally proves powerfully diuretic. It was employed by Dr. Fowler with considerable success in dropsy; and Dr. Darwall speaks of it as "particularly useful in dropsy connected with enlargement of the liver and spleen, but little to be relied upon when the principal disease is situated in the chest." He also states that "he has never seen any evil effects resulting from its use." (*Cyc. of Pract. Med.*, article *Dropsy.*) It was given by Fowler in the form of an infusion, made by pouring a pint of boiling water on an ounce of the leaves, macerating for an hour, straining off fourteen ounces, and adding two ounces of alcohol. The dose was thirty drops three times a day, to be gradually increased until diuresis was produced, or the effects of the medicine upon the stomach or head were felt.

Numerous other diuretics of greater or less power are occasionally employed, either as remedies in chief or as adjuvants. The spirit of nitrous ether may be usefully added to other remedies when there is not too great inflammatory excitement, and especially when the disease is complicated with nervous derangement. The infusion of juniper berries is much used as a vehicle and adjuvant, and will sometimes, unaided, remove moderate dropsical effusion; such, for example, as is apt to come on towards the close of chronic pectoral affections. The compound spirit of juniper is a good addition to diuretic mixtures or drinks, in cases of debility. Infusion of buchu has been strongly recommended in connection with the alkaline bicarbonates. (*Braithwaite's Retrospect*, Am. ed., xvii. 33.) Infusions of wild carrot, parsley-root, and the different species of erigeron or flea-bane, are occasionally administered with benefit, though never solely relied on. Dandelion, in decoction or extract, is peculiarly adapted to cases of dropsy connected with chronic disease of the liver. Pipsissewa, in the same way, proves useful where a gentle tonic and astringent are indicated in conjunction with a diuretic. Various liquid preparations of colchicum were formerly used, and, though nearly abandoned in dropsy, might prove serviceable in those instances, not very uncommon, in which the disease is associated with gout or rheumatism. Various stimulating substances, with diuretic properties, may be employed in chronic cases, and others attended with great debility. Such are horseradish, mustard, onions, garlic, buchu, copaiba, oil of turpentine, and cantharides.* The two last-mentioned substances have been recommended in great insensibility or paralysis of the kidneys, with a more or less complete suppression of urine. Sulphate of copper was formerly employed in cases of debility; but is little used at present. Besides those mentioned, a long list of substances might be enumerated, which have enjoyed more or less credit as diuretics in dropsy; but, having been mostly laid aside after experience of their inefficacy, they scarcely merit notice. It is, however, desirable to have at command, in a disease so frequently obstinate and protracted, numerous and diversified remedies, though of very unequal power. The caprices of the stomach, the prejudices and anxieties of the patient, and the frequent failure of even the most efficient remedies, render changes necessary; and, without a long catalogue, we should be compelled to stop for want of sufficient material. Besides, diuretics are notoriously uncertain, so that upon failure with one, it is necessary to resort to another; and not unfrequently a persevering trial of the means at command is at length repaid by success, when the physician has almost ceased to hope for it. Much may also be effected by the combination of these remedies. Advantage has sometimes accrued from two or more diuretics mixed together, which had before severally failed. Numerous formulas of this kind have been proposed by different authors, which it would be useless to repeat; as each practitioner acquainted with the list of remedies, and their several qualities, can just as efficiently arrange them for himself. The combination of diuretics with tonics is highly advantageous in cases of debility. Thus, squill and the saline diuretics may be given in connection with the infusion, tincture, or extract of the simple bitters, as gentian or quassia, with the preparations of cinchona, or with the salts of iron. Chalybeates are of great advantage in anemic cases, particularly those following miasmatic fevers; and sulphate of manganese is said to have proved effectual under similar circumstances. Nux vomica has also been recommended as an adjuvant to the diuretics in atonic dropsy.

Cathartics.—Scarcely less efficient than diuretics are the medicines belonging to the class of cathartics. They operate upon the same principles, of promoting absorption by diminishing the amount of fluid in the blood-vessels, and of calling off irritation from the morbidly secreting surfaces to the seat of their own action. In the latter respect, they are even more efficient than the diuretics. But they debilitate much more by an equal amount of depletion, and are, therefore, not so well adapted to cases of an asthenic character. There is very frequently, moreover, a degree of stomachic or intestinal irritation in dropsy, which renders their steady employment hazardous; and, in gouty cases, they might prove injurious by inviting the disease from some safe exterior position to the alimentary canal. With a due regard to these considerations they may be employed safely, and often with great effect. Discrimination is necessary in their selection. Those should obviously be preferred which produce copious serous exhalation from the bowels, in other words, the hydragogue cathartics; and even among these there is much room for choice. In febrile and inflammatory cases, the saline cathartics should be employed in consequence of their refrigerant properties. The best of these, for the purpose, are perhaps the bitartrate and tartrate of potassa, and the tartrate of potassa and soda. These should be given, not in small and repeated doses, as when administered with a view to diuretic effect, but in large purgative doses, at distant intervals. When not of themselves sufficiently powerful, they should be combined

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* The following formula for a stimulating diuretic infusion was much employed by the late Dr. Joseph Parrish; and I have used it myself with advantage in long-standing dropsy with debility. Take of juniper berries, mustard seeds, ginger-root, each, bruised, ℥j; horseradish, parsley-root, each, bruised, ℥ij; hard cider, Oiv. A wineglassful to be taken four times a day, and gradually increased.

ome one of the hydragogue vegetable cathartics, such as senna, or jalap.
ture of jalap and cream of tartar has long enjoyed high credit in the
ent of dropsy. In chronic cases, when the bowels are torpid, and the
system exhibits rather a want of due susceptibility to impressions than
debility or prostration, recourse may be had to the drastic hydragogues.
nony, black hellebore, buckthorn (rhamnus catharticus), gamboge, cro-
, and elaterium are those which enjoy the highest reputation. Of these,
ge and elaterium are probably the most efficient. Dropsy not unfre-
y yields to the judicious employment of these remedies alone. Gamboge,
apt to irritate the stomach, should generally be given in small doses,
m half a grain to two grains, repeated at intervals of one, two, or three
till it operates. Advantage will also accrue from combining each dose
drachm or two of cream of tartar. The effects of elaterium are some-
urprisingly prompt and powerful. I have known great abdominal dis-
to yield to two doses of this medicine. From its violence, however, it
e administered with caution; and, if symptoms of gastro-intestinal in-
ation occur under its use, it must be at once suspended. Croton oil is
ly recommended by Dr. Geo. Fife, of Birmingham, England, in the dose
op daily. He considers it even more efficacious by its stimulating effect
orption, than by its purgative operation. (*Lancet*, March 14, 1857, p. 20.)
re is a set of emeto-cathartic medicines, possessing diuretic properties,
have been occasionally used in dropsy with good effect. Such are the
(scoparius), hedge hyssop (gratiola officinalis), the inner bark of dif-
species of sambucus or elder, the juice of the root of black elder, and
ot of our indigenous apocynum cannabinum. Cahinca, which a few
since enjoyed a short-lived popularity, has been again brought forward
Genovè as an efficacious remedy. (*Ann. de Thérap.*, A.D. 1862, p. 91.)
ation to the dose and proper mode of administration of this, and of the
medicines mentioned, the reader is referred to the U. S. Dispensatory.

frequency of repetition of the cathartic must be regulated by the
th and susceptibility of the patient. When the constitution is vigorous,
e bowels not peculiarly sensitive, it may be given every day. In few
an much permanent good be expected from it, if repeated less frequently
wice or three times a week. The purgative, as in the case of the diu-
nay be combined with the bitter tonics or chalybeates, when these medi-
are indicated; and, if the patient should be very feeble, advantage might
from the use of the purgative tinctures, as those of senna, jalap, and
hellebore, in connection with other preparations.

phoretics.—In some instances, diuretics will not act, and purgatives are
indicated, or have been tried without effect. Here diaphoretics may be
d to, and will occasionally produce cures; though, upon the whole, they
e admitted to be much less efficient than medicines of the two preceding
. The best diaphoretic in dropsy is probably the officinal powder of
uanha and opium. It is asserted that dropsy has been cured by large
of opium alone; but its efficacy is much increased in this combination
good, it must be used freely, and the patient kept for a considerable
nder its influence, so as to sustain a copious and continued perspira-
In febrile cases, with a strong pulse, preference should be given to the
onials and refrigerating diaphoretics, as citrate of potassa and acetate
monia, with which the spirit of nitrous ether may sometimes be com-
During the course of the treatment, the patient should be kept in
The effect of the diaphoretic may be much increased by external means.
the skin is hot and the circulation active, the warm bath should be used.
other instances, the vapour bath, or dry hot-air bath, might be found
ffective. I have known one almost desperate case of general dropsy

to yield to an energetic use of Dover's powder and the hot bath, after failure with diuretics. The excessive sweating induced by temporary confinement in an apartment heated considerably above the temperature of the body, would probably prove highly serviceable in some cases of dropsy. Even friction to the surface is said to have effected cures.

Emetics.—When the strength of the patient is sufficient to bear the exhausting effect of repeated emetics, it is probable that they might be advantageously used, as they are well known powerfully to promote absorption. The antimonial emetics were recommended by Sydenham in this disease. At present, however, neither these nor other medicines of the same class are much used in the treatment of dropsy.

Mercury.—This is occasionally very efficient. Its power of increasing secretion and absorption would appear to render it applicable to dropsy in general; while its antiphlogistic action would render it especially useful in the advanced stages of those cases which have originated in inflammation, whether of the serous and areolar tissues, or of some important organ, as the liver or the heart. Hence, it is often most happily combined with other remedies, whether diuretic, diaphoretic, or purgative, increasing the powers of these remedies, at the same time that it exerts an independent influence of its own. The medicines with which it is most frequently associated in dropsy are squill and digitalis. Calomel, the blue pill, or corrosive sublimate, may be employed according to the circumstances of the case. A combination of squill and calomel is considered as one of the most efficacious remedies in dropsy, especially when associated with chronic visceral inflammation. It has been customary to administer pills composed of two grains of squill and one of calomel three times a day. This quantity of squill, as the medicine is commonly found in our shops, is too small. The dose should be repeated every two or three hours unless it nauseate too much. That of the calomel is probably rather too large. Considering the excessive susceptibility of some dropsical cases to the influence of mercury, it would in general be better to commence with a smaller dose, and increase as the occasion may require. Perhaps the worst instance of salivation which I have personally witnessed, and in which the patient barely escaped with life, arose from six grains of calomel given in doses of a grain each as above recommended, in a case of general dropsy. It is said that the system is peculiarly susceptible to this influence in the renal variety of dropsy, and mercury is consequently dreaded by some physicians in that affection. But cures of the dropsy sometimes follow these excesses of the remedy, which would probably, therefore, prove useful by a more moderate action; and strict caution would sufficiently guard against inconvenient results. Mercury is decidedly contraindicated in cases of pure anæmia or great debility, and in those in which the dropsy depends upon some incurable organic affection, as fatty degeneration of the kidneys, scirrhus and tubercles of the liver, or a tuberculous condition of the dropsical tissue.

Mechanical Means.—When the measures above detailed prove inadequate to the removal of the effused liquid, and the distension becomes painfully inconvenient, recourse may be had to mechanical means of relief, such as puncture with a sharp lancet, acupuncture, and tapping. Great relief is obtained by these means, and occasionally they seem to prepare the way for the efficient action of remedies which had failed before, probably by removing that compression which may have cramped absorption. It has occurred to me repeatedly to see the kidneys brought in this way into efficient action, and the health of the patient restored when almost despaired of. These measures, however, require to be used with caution. The particular circumstances which justify or forbid their use, will be most conveniently detailed under the different forms of dropsy considered in relation to their position. Remarks upon blisters, as depletory agents, will be best postponed to the same occasion.

It remains to treat of the measures of relief peculiarly adapted to those cases of dropsy which depend on certain organic affections.

In the *cardiac dropsies*, attention must be paid to the disease of the heart, which, if incurable, must be palliated by appropriate remedies. It is especially important, in all cases, that the patient should use no active exercise. When the dropsy is associated with chronic inflammation of the organ, great relief, if not a cure, may be hoped for from local depletion and blisters, and a moderate mercurial impression maintained for a considerable time, in connection with suitable remedies for the removal of the effusion. In the choice of these remedies, reference must be had, as in other cases of dropsy, to the state of the system; and similar auxiliary means must be employed to reduce excessive, and support deficient action. It is indispensable that any anemic condition of the circulation should be corrected, as this has a powerful effect in increasing the cardiac disease. Of the diuretics, digitalis is peculiarly applicable in consequence of its double action on the heart and the kidneys; and, combined with squill and calomel, or the blue mass, in cases calling for the mercurial influence, it is often productive of the best effects. The preparations of colchicum are also peculiarly adapted to cardiac dropsies, from their control over the rheumatic or gouty irritation in which the affection of the heart has not unfrequently originated, and by the continuance or recurrence of which it is aggravated or sustained. Though effectual cures of dropsy originating in this cause can seldom be expected, much may be done for temporary effect; and, by a judicious employment of remedies, and regulation of the patient's habits, not only may his comfort be greatly promoted, but his life frequently much prolonged.

Whatever is peculiar in the treatment of *hepatic dropsy* will be more conveniently considered under ascites, which is the form of dropsy most frequently originating in disease of the liver.

Renal dropsy, connected with active congestion or inflammation of the kidneys, sometimes requires, in its earlier stages, the application of cups to the small of the back, which may be repeated if the state of the circulation permit. In the variety following scarlet fever, it is sometimes advisable even to take blood from the arm, especially when there are threatening symptoms of meningitis, peritonitis, or other serous inflammation. Care, however, must be taken not to push depletion too far, in consequence of the strong disposition to anæmia which characterizes the affection in its more advanced periods. Some advantage may also be hoped for from counter-irritation to the loins by means of solution of ammonia, tartar emetic, or issues. Blisters, though recommended by some, are of doubtful propriety, from their tendency to produce strangury. Purgatives are peculiarly adapted to this variety of dropsy; the indication being to divert excitement from the congested or inflamed kidneys. Upon the same principle diaphoretic measures promise favourably. Theory would certainly suggest these two means of evacuation, at least in the earlier stage of the disease, as preferable to diuretics, the stimulant action of which is directed especially to the kidneys, and which might, therefore, endanger an increase of the very affection supposed to lie at the root of the whole disorder. But our knowledge on this subject is yet too indefinite to justify the rejection, upon the ground of theoretical inference, of any measure that may have experience in its favour; and certainly there is strong testimony in support of the usefulness of at least two diuretics in this variety of dropsy; viz., cream of tartar and digitalis. I have, indeed, found them the most effectual remedies as regards the dropsy, and productive of no observable injury to the kidneys. They may, therefore, be resorted to at any stage of the complaint, unless that of greatest debility. The same cannot be said of the more stimulating diuretics, which should be employed only under circumstances decidedly calling for their supporting influence. Perhaps, on the whole, the best plan would be first to try cathartics and diaphoretics, connected with direct depletion, in an obviously inflammatory condition of system, and, failing with these, to have recourse to the two diuretics alluded to, with others of a similar character. Mercury must be looked upon as of doubtful propriety. It is asserted of itself occasionally to give rise to coagulable urine, and is believed to have a direct influence in impoverishing the blood; effects which, as they are in some degree characteristic of renal dropsy, would seem to exclude their cause from the list of its remedies. Nevertheless, instances have occurred in which salivation was followed by permanent benefit; and, if the affection of the kidney be regarded as inflammatory in its character, the powerful antiphlogistic agency of this remedy would seem to be indicated. If employed, it should be so with much caution, in consequence of the peculiar susceptibility of patients in this disease to be violently affected by it; and its use should not be extended into the latter stages. It should never be used in the cases of renal dropsy dependent upon fatty degeneration of the kidneys. In these cases, along with the diuretics referred to, recourse must be had to means calculated to improve the blood, and invigorate the system. (See *Bright's Disease.*) Dr. Corrigan, of Dublin, has found iodide of potassium peculiarly efficacious in this form of dropsy.

Diet and Drink.—The free use of drinks was formerly denied to dropsical patients, under the impression that they served to supply additional stimulus to elimination, and at the same time additional material for the function. This theoretical ground of exclusion still continues, with the superadded reason, afforded by recent investigations, that fulness of the blood-vessels is the greatest impediment to absorption. Nevertheless, experience has decided against these hypothetical deductions; and nature, by the frequently urgent thirst which attends dropsy, and the extreme distress if it be denied gratification, throws the weight of her indications into the same scale. Practitioners now generally leave their patients to their own discretion in relation to the quantity of drink. A good rule is that the liquid should be taken cold, and in small quantities frequently repeated, rather than in large draughts at once. Thirst is thus effectually relieved, while the stomach and blood-vessels are not so much overloaded. The choice of the drink must depend upon circumstances. Cold diuretic infusions sometimes satisfy the patient, and are better than cold water alone. In cases not inflammatory, old cider sometimes answers well; and, when spirituous liquors are indicated on account of previous habits or debility, gin should be preferred. The infusion of horseradish, mustard, juniper, &c. in hard cider, as directed in *page* 402, is sometimes useful. No general rule can be given in relation to diet. The practitioner will, in this respect, be guided by the particular circumstances of each case, enjoining an antiphlogistic regimen in inflammatory cases, nutritious food in the anemic and debilitated, and an easily digestible diet in enfeebled digestion, and always avoiding unnecessary interference with the habits and preferences of the patient.

Article II.

ANASARCA.

This term, derived from the Greek (ἀνὰ, through, and σάρξ, flesh), signifies dropsy of the exterior cellular or areolar tissue. It is not usually extended to effusions into the cellular tissue of the interior organs considered separately, as, for instance, into the parenchyma of the lungs, or the submucous structure. Nor is it customary to apply it to dropsical effusions of the exterior cellular tissue when of very small extent and quite local; these being designated by the term *œdema*.

The first symptom of anasarca is usually a swelling of the feet and ankles, appearing towards evening, and diminishing, if not quite disappearing, before morning. It is distinguished from other swellings by pitting under pressure, that is, by retaining for a considerable time the indentations made by a compressing body. This tumefaction of the lower extremities does not imply that the effusion of fluid is confined to these parts. The cells of the areolar tissue communicate, so that fluid passes readily from one part of the body to another. In anasarca, the effusion generally takes place in various portions of the body, sometimes probably throughout the whole exterior structure. During the day the fluid gravitates into the feet, which are the lowest part, and at night is again diffused over the frame in consequence of its horizontal position. Sometimes, however, the effusion actually takes place first in the feet and legs; as in cases of debility, in which the want of energy in the circulation allows the blood to accumulate in the veins of the extremities, and thus to induce a condition favourable to the transudation of serum. In some instances, the tumefaction is first observed in the face, particularly about the eyes. This is apt to happen in febrile dropsy, in which the liquid is more quickly effused, and does not appear to travel so rapidly, and in certain conditions of diseased heart, in which the greatest stress of the circulation is upon the upper part of the body. Another condition in which the effusion is likely to appear originally in the face, neck, or upper extremities, is that of obstruction in the veins which reconvey the blood from these parts, as in the descending vena cava. Cases of this kind have occurred, in which the dropsy was confined to one arm. In certain rare instances of extremely rapid effusion, the dropsical swelling has shown itself simultaneously over the whole body.

The swelling of the feet and ankles, in most instances, gradually increases, extends up the legs and thighs, encroaches upon the abdominal and thoracic parietes, and at last reaches the head and upper extremities, so that the whole body becomes bloated, and sometimes to an enormous extent. The parts in which the areolar texture is loose suffer tumefaction in the greatest degree. Hence, the backs of the hands and tops of the feet, the eyelids and neighbouring parts, the scrotum and areolar tissue of the penis in males, and the labia pudendi in females, become greatly distended. The swelling of the privates is often so great as to occasion much inconvenience, and in the male even to interfere with micturition. The lower extremities are often enormously increased in bulk, and the skin stretched, tense, and shining. Sometimes the cuticle rises in the form of blisters, or the skin itself gives way; an erysipelatous inflammation invades the integuments; the areolar tissue sloughs; and sores are formed, which become the outlets of great quantities of serous fluid, and thus afford much relief to the patient. Instances have occurred in which permanent cures have been effected in this way; but more frequently, though the patient may obtain some ease from his oppression, the conjoined exhaustion and irritation are more than his enfeebled system can support, and the case terminates fatally.

Most frequently the anasarca when extensive is attended with effusion into the serous cavities, which greatly increases the danger, and often proves the immediate cause of death. In some instances, however, the disease runs its course without such complication. Sometimes the anasarcous swelling suddenly disappears, and, by a sort of metastasis, is succeeded by effusion into the ventricles of the brain, or into the thoracic or abdominal cavity.

This form of dropsy is liable to all the diversities of character which have been described under dropsy in general. It may be acute or chronic, sthenic or asthenic, febrile and inflammatory, or anemic. When it is of a febrile character, and dependent on irritation of the secreting tissue, the swelling is more firm and elastic, and the impressions made by the finger are sooner effaced than in other forms of the disease. In some instances, the excitement amounts to inflammation, and disagreeable sensations are experienced in the affected part, with tenderness on pressure. The febrile forms of anasarca are occasionally, moreover, attended with inflammation of some interior structure, especially of the serous membranes, and the kidneys. In cases dependent on general debility or a watery state of the blood, or upon organic affections of the heart, the tumefaction is usually soft, and pits easily under the fingers.

Anasarca is usually attended with much loss of flesh, and, in those portions of the body not occupied by the effused fluid, the emaciation is sometimes extreme. This condition is very striking in old cases, in which a sudden absorption of the dropsical fluid takes place.

The diagnosis of the affection is scarcely ever doubtful. Sometimes there may be difficulty for a time in deciding whether an edematous state of the feet and legs is merely local, and dependent on inflammation of the areolar tissue from gout, rheumatism, or other cause, or whether it is properly dropsical. But, in the latter case, the progress of the disease will in general soon settle the question. General emphysema might be confounded with dropsy; but the crackling under the fingers in the former will sufficiently distinguish it.

After death from anasarca, the areolar tissue is found greatly distended. That beneath the skin is usually most so, but the effusion is observed also in the deeper structure, and even in the substance of the muscles and viscera, which are softened, pale, and disposed to speedy putrefaction. Sometimes the serum is observed to have accumulated in the tissue subjacent to the mucous membranes, which are elevated, and assume a somewhat jelly-like appearance. Indeed, one of the causes of death in dropsy is the serous effusion beneath the mucous lining of the air-passages.

In relation to the causes and general treatment, there is nothing so peculiar as to require particular notice. The reader is, therefore, referred to the subject of dropsy in general. There is one remedy, however, recently recommended in anasarca with albuminous urine, by Dr. P. Garnier, of Paris, as having extraordinary efficacy, which deserves peculiar attention in this place. The remedy referred to is tannic acid, which is given by Dr. Garnier to the amount of from half a drachm to a drachm daily. In this quantity, it manifests its curative influence by producing copious discharges of urine, which speedily resumes its healthy character, while the perspiration, alvine evacuations, appetite, &c. become normal. These favourable effects begin to appear even from the second day of its exhibition. From three to seven grains may be given at a dose without inconvenience. (*Arch. Gén.*, Janv. 1859, p. 85.) In the dropsy following scarlatina, Dr. Hamburger, of Prague, has found great advantage from the use of quinia, having given it in 47 serious cases, of which 44 were very quickly ameliorated, and only 3 resisted its favourable influence. (*Ibid.*, Avril, 1861, p. 495.)

A few observations in relation to the local treatment of the disease will be in place here. Bandages to the limbs have been recommended. In most cases they can be of no service. But, when the affection is confined to the feet and legs, either originally or towards the close of a more extensive affection, a well-regulated pressure may be useful by promoting absorption. In some instances, too, of very great distension, it is possible that good may be done by careful bandaging, in obviating inflammation, ulceration, and sloughing.

Blisters to the extremities have sometimes been employed to promote the discharge of the effused serum, and they may undoubtedly afford relief in this way. But their advantages are far overbalanced by the danger of obstinate ulceration, erysipelatous inflammation, and gangrene from their use; and they have now been universally abandoned. I have seen one striking case, in which an enormous ulcer on each leg followed the application of blisters; and, though

opsical symptoms entirely disappeared, the patient died under the com-
irritation and exhaustion produced by them. Still less admissible are
tual cautery, and the seton, formerly recommended.
all punctures may often be made with advantage in cases of great disten-
The quantity of liquid which escapes even from a few of these minute
es is sometimes astonishing, and the relief to the patient indescribable.
hey are not without hazard. Even in robust patients they are often at-
d with more or less inflammation, and sometimes end in obstinate sores,
h fatal effects very rarely ensue; but in the feeble, in whom the powers of
re already nearly exhausted, they not unfrequently seem to hasten the
The inflammation extends rapidly over the limb, sinks into the areolar
, and occasionally gives rise to extensive gangrene, preceded by severe
I have repeatedly known patients to die from the effects of these punc-
after having been greatly relieved for a time by the discharge of the
d fluid. They should, therefore, always be practised with caution, and
in the very feeble, unless the symptoms of oppression be so excessive
threaten immediate death. Under these circumstances, they may, per-
be considered as the less of two evils. In young or middle aged pa-
, with considerable vigour of constitution, they may be resorted to when-
he distension becomes very distressing, and has resisted the usual diuretic
urgative remedies. The punctures should be made with a very sharp
t, and not deeper than merely through the skin. They should never be
rous, and frequently three or four in a limb will be sufficient at one time.
are most effectual for the discharge of the fluid when made on the top
foot, or in the leg above the ankle; but are thought to be safest in the
s. When the scrotum and penis, or labia pudendi, are very much swol-
hey may often be punctured in the same way with much advantage. It
l that slight incisions, half an inch or an inch in length, merely through
ticle, answer a good purpose, and are less liable to be followed by mis-
ous consequences. Acupuncture has been of late recommended as less
dous than incision, though this also is not without its danger. The punc-
should be made with a sharp, highly polished, and fine needle, should
be so deep as to penetrate a fascia, and should not be nearer to each
than an inch and a half or two inches. Incision would probably be pre-
e to puncture by coarse or three-sided needles, which have been advised,
re would be less contusion and probably less danger of inflammation.
en the extremities become inflamed in dropsy, whether spontaneously or
sequence of wounds, the patient should lie in bed with the limb some-
elevated; lead-water or flaxseed mucilage should be applied to the in-
d surface; or the parts should be enveloped in an emollient poultice, to
, in case of gangrene and sloughing, a solution of creasote may be
l with advantage.

Article III.

DROPSY OF THE BRAIN, OR HYDROCEPHALUS.

e term hydrocephalus is, in this work, considered as embracing only
cases of serous effusion within the cranium which are independent of
mation. The affection usually denominated acute hydrocephalus is no-
more nor less than meningitis, either simple or tuberculous, and owes
of its symptoms or result to the effused liquid, which may or may not
in any particular case. It has been questioned whether there is such
ection as proper acute hydrocephalus, in the sense in which the word
e used. The affection is undoubtedly rare; but there seems to be no

rational ground for denying its existence; as cases have been reported in which death has occurred after a brief illness, with symptoms of cerebral disease; and serous fluid in abnormal quantity has been found within the cranium, without any other appreciable lesion. Yet there are no signs by which such an affection, occurring after a complete formation of the cranium, could be distinguished with certainty from apoplexy, or meningitis affecting the base of the brain; and it is unnecessary, in a practical point of view, to give it a distinct consideration. The following observations, therefore, apply only to cases in which the disease is slowly developed.

The effused liquid in hydrocephalus may occupy the ventricles, the cavity of the arachnoid, the tissue of the pia mater, or the substance of the brain, which is infiltrated with it. In the last two situations, however, the quantity of the liquid is always small; and its influence in producing the symptoms so doubtful that it may be left out of view. By some pathologists the situation is indicated by the name; the disease being denominated *hydrocephalus internus* when the effusion is seated in the ventricles, and *hydrocephalus externus* when in the cavity of the arachnoid.

The disease may be congenital or acquired. The congenital cases are almost always connected with organic defect in the encephalon, such as a partial or entire want of brain; and, ending fatally either during labour, or within a short period after birth, scarcely merit the notice of the practitioner. It is only the acquired disease with which we are concerned.

This occurs chiefly in the young, especially in infants before the closure of the fontanels; but may happen at any period of life. Yet in relation to cases in which the cranium is incapable of expansion, there must always be some doubt; as the only certain criterion of the presence of water is the increased size of the head. Various organic diseases of the brain, of a chronic character, are capable of producing symptoms closely analogous to those of hydrocephalus; and any diagnosis that may be formed in such cases must be more or less conjectural. All that can be said with propriety is, that, when a case exhibits the ordinary hydrocephalic signs, with the single exception of the expanded cranium, after the complete union of the bones of the head, there may very probably be dropsy of the brain.

Symptoms, Course, &c.—The most obvious phenomenon in hydrocephalic patients is the enlarged, or gradually enlarging head. The expansion takes place usually in all parts of the bony case of the brain, except the base; but it is generally most conspicuous in the frontal, parietal, and occipital regions; the top of the head being comparatively little affected. As the face is in general not larger than usual in health, the forehead and sides of the cranium are made to project very much, and give to the child a peculiar aspect. In some instances, it is said that the face undergoes a corresponding development, and the whole head appears gigantic. The enlargement is sometimes irregular, affecting especially the forehead, or the parietal region, and much greater on one side than the other, so as to occasion great deformity. The fontanels expand very much, the sutures not unfrequently open, and the bones of the cranium seem in some extreme cases to be almost floating upon a surface of liquid. Fluctuation can be perceived between them; and the interosseous spaces are either at the level of the surface, or project somewhat above it. In some cases in which the collection of water is very great, the head appears somewhat translucent, if placed between the eye and the light.

After a length of time, which is exceedingly variable, if the patient survive, the interosseous spaces are gradually converted into bone, and the cranium becomes entire; but it is no uncommon event for the fontanels to remain open in hydrocephalic patients for many years. After the complete ossification of the cranium, the head ceases to expand; and, unless there should to be a cessation of the gradual increase of the effusion, severe symptoms soon make their appearance. While the bones yield readily to the accumulating liquid, and no great pressure is exerted upon the brain, it not unfrequently happens that the general symptoms are not striking. When the disease attacks children whose fontanels have closed, the expanding force is sometimes sufficient to reopen them, and this event has happened as late as the eighth or ninth year.

The size which the cranium is capable of attaining in this complaint is enormous. Thus, the circumference of the head in a child two years old, under the notice of Willan, was twenty-nine inches; and in another of fourteen months, seen by Barthez and Rilliet, nearly twenty-three inches. In general, however, the size is much less, and it varies by every gradation from the least visible expansion to the largest dimensions mentioned.

The first signs of the evil effects of the accumulated fluid are not easily defined. They consist usually in some deficiency or irregularity of nervous action. Certain symptoms are to be ascribed, in part at least, to the increased weight of the head. The child walks with a somewhat tottering or uncertain gait; and not unfrequently falls. He either holds his head stiffly and watchfully erect, so as to prevent its falling on either side, or supports it by his hand, or upon some object in his vicinity. In bed, he usually lies upon his back. The limbs are frequently affected with tremors. There is occasionally pain in the head or limbs, which appears to be paroxysmal, and, when most violent, causes the child to scream. The acuteness of the special senses is diminished. Dimness of vision occurs, which in some instances increases to blindness, while in others the patient can see to the last. The skin becomes more or less insensible; and the smell and taste are sometimes affected. Hearing is usually the last of the special senses to fail. The intellect is seldom materially deranged in the earlier stages; though the memory is obviously enfeebled, and not unfrequently a certain dulness or hebetude of mind is obvious. The digestive function often remains long unimpaired. Indeed, the appetite is sometimes keen, and, unless some other disease complicates the case, the patient may even increase in flesh. But more frequently he emaciates, notwithstanding that he may take more than the usual quantity of food. The bowels are costive throughout, and the urine scanty. A disposition to copious secretion of tears and of saliva has been noticed. At length symptoms of more profound cerebral lesion appear; such as occasional vomiting, contraction of the flexors of the limbs, muscular rigidity, strabismus, grinding of the teeth, epileptic convulsions, partial palsy, and mental imbecility, with a disposition to drowsiness or stupor. These symptoms are soon followed by complete loss of consciousness, abolition of the senses, especially of vision, involuntary discharges from the bladder and bowels, a small, feeble, irregular, and frequent pulse, stertorous respiration, and death.

The duration of the disease is uncertain. Most of those affected die in infancy. Some live on for many years, and now and then one to adult age, and, it is said, even to old age.

Anatomical Characters.—The quantity of liquid found in the ventricles varies greatly. It may be only a few ounces, or it may be pounds. Dr. Bright has reported a case in which seven or eight pints were taken from the head of a man, who had been affected with the disease from infancy, and died when near thirty. The ventricles are often expanded into one great cavity. The consistence of the brain may be natural, though in some instances hardened, and in others softened to a greater or less depth from the surface of the ventricles. The brain is sometimes spread out, in the form of a layer, perhaps not more than half an inch or an inch in thickness, upon the inner surface of the cranium; the shape of the hemispheres being lost, and the convolutions obliterated.

Instead of the ventricles, the arachnoid sometimes contains the liquid, in which case, instead of being unfolded into a sort of bag, the brain is apparently compressed into the bottom of the cranial cavity, with the liquid above it. In this case, the form of the brain is preserved, and the convolutions are not effaced. The head is thought not to be susceptible of so great an enlargement as when the effusion has taken place in the ventricles.

In other instances, the cavity of the ventricles and that of the arachnoid are thrown into one by the opening of the commissures of the brain, of which the central portions now present upward, and the hemispheres appear as if folded back.

It might be supposed that, compressed as the brain is by the liquid, it would be diminished in weight. But this does not seem to be the case in the varieties just described, at least not to any considerable extent.

The liquid is usually perfectly colourless and limpid; but sometimes, especially in the cavity of the arachnoid, it appears like a bloody serum, and is partially coagulable. It generally contains a minute proportion of albumen, sometimes a little osmazome, and various saline substances, such as chloride of sodium, phosphate of soda, &c., also in very small proportion.

The bones of the cranium are sometimes as thin as paper, and very fragile, sometimes of a not disproportionate thickness, and in other instances much thickened, even to the extent of nine or ten lines. In the last case, they are usually spongy as in rachitis, and, when otherwise, owe their development, perhaps, to the deposition of bony matter upon the inner surface, to supply the deficiency resulting from the partial absorption of the effused liquid.

Causes.—It is possible that the same condition of the blood and of the extreme vessels, which induces dropsy in the areolar tissue and the serous cavities, may operate in the brain so as to occasion hydrocephalus, especially when, from a want of union between the bones of the cranium, little resistance is offered to the accumulation. But, in the greater number of cases, the effusion appears to be owing to tumours in the substance of the brain or cerebellum, and especially to tubercles, which press upon the veins, and thus induce effusion, exactly as tumours in the abdomen give rise to ascites. It is stated that tumours are not apt to produce this effect until they have attained considerable size, and they are more apt to produce it when seated in the cerebellum, or near the base of the brain, than elsewhere.

Diagnosis.—There would seem to be little difficulty in distinguishing cases of hydrocephalus, when attended at once by enlargement of the head, and the general symptoms indicative of cerebral lesion. It is necessary, however, for the practitioner to be on his guard not to mistake for this disease cases of naturally large heads, and those in which the cranium is thickened and spongy, as sometimes happens in rachitis. Hypertrophy of the brain, occurring at the same period of life, may be attended with increased dimensions of the cranium, and with signs of cerebral lesion; but in this affection there is less of evident cerebral disease in its progress, until the acuter symptoms come on which terminate fatally, and there is also less tendency to produce local derangements, as in a particular limb or muscle; but it must be confessed that the diagnosis is obscure. This affection, however, is comparatively very rare.

Prognosis.—The prognosis is generally unfavourable. When dependent on mere functional derangement, this form of dropsy may end in recovery as well as any other form; but most frequently it is connected with irremovable causes, and necessarily ends in death. When consequent upon scarlatina or other febrile disease, it may be considered as probably independent of organic lesion, and its cure may be hoped for. When associated with an obvious tuberculous diathesis, it may be considered as almost desperate. But, generally speaking, it is impossible to determine its precise origin; and a guarded prognosis should always be given.

Treatment.—This consists essentially in the production of the mercurial impression, and the use of diuretics and cathartics. In addition, when the child is scrofulous or anemic, the chalybeates, preparations of iodine, decoction of pipsissewa, and cod-liver oil may be used. Revulsion to the scalp by means of blisters, croton oil, oil of turpentine, or other irritant substances, has also been recommended. Care must be taken, in the use of the remedies, not to exhaust the strength. To produce the mercurial impression, small doses of calomel or the blue pill may be given internally; and mercurial ointment rubbed upon the inner surface of the limbs, and on the scalp. Of the diuretics, squill, spirit of nitrous ether, bitartrate of potassa, and perhaps digitalis may be used, though the last always with caution. Cream of tartar, combined, when the patient is somewhat vigorous, with jalap, would be the best cathartic. Of the preparations of iodine, iodide of potassium is usually preferred.

The following is the plan employed by Gōlis, for which he claims great success. The head is to be kept constantly covered with a woollen cap, and every night one or two scruples of mercurial ointment, mixed with an ointment made from juniper berries, are to be rubbed upon the scalp. Calomel is to be given in doses of one-quarter or one-half of a grain, twice a day; care being taken that too much purging is not produced. For young infants, the best diet is the mother's milk, or that of a healthy nurse; for older children, meats, eggs, and coffee made from roasted acorns. Fat substances, and all alcoholic liquids are to be excluded. In pleasant weather, the child should be as much as possible in the open air. In winter, the temperature of the chamber should be about 68° or 70° F., and the child should lie on a mattress, and be carefully guarded against currents of air. Gōlis asserts that this plan, duly persevered in, has produced complete and lasting cures in many instances. Should no improvement be perceived at the end of two months, he advises the use of diuretics, such as acetate of potassa and squill, in connection with the former medicines, and the insertion of an issue in the neck or arm, which is to be kept discharging for several months. Should inflammatory symptoms intervene, the antiphlogistic treatment is to be employed. After the commencement of recovery, advantage sometimes accrues from small doses of quinia.

Dr. Watson relates the following mode of cure as having been effectual in two cases. It was employed at the suggestion of Dr. Gower, and succeeded after the blue pill, diuretics, purgatives, &c. had been used without effect. Ten grains of metallic mercury were rubbed with conserve of roses; five grains of *fresh* squill were added; and the whole made into pills with powdered liquorice-root. This quantity was taken three times a day, for nearly three weeks. It acted powerfully as a diuretic, without salivation, but with great reduction of strength and flesh, and gradual relief to the symptoms. It was continued for two weeks longer, at first twice, and afterwards once daily; at the end of which time the cure was complete. The strength was restored by the use of iron.

A case is recorded in the *Lancet* (April 30, 1859, p. 44), by Dr. Wm. Thorn, in which a cure seems to have been effected, in an infant of nine months, by the use of laudanum, given with a little sweet spirit of nitre, in the dose of one and a half minims every four hours.

Compression and tapping of the head have been frequently employed in cases of chronic hydrocephalus, and sometimes with asserted success. Mr. Barnard's method of compression, which has proved successful in several instances, is to apply strips of adhesive plaster, about three-quarters of an inch wide, completely round the head, from before backward; then to carry cross strips from one side of the head to the other over the crown, and, lastly, one long strip from the root of the nose over the vertex to the nape of the neck. This plan is applicable only to cases in which the bones are loose, and the general powers feeble, as shown by paleness of the surface, flabbiness of the muscles, &c.

(*Watson's Lectures.*) Should the symptoms be aggravated by the pressure, it must be relaxed or abandoned. Mr. Richard Phillips employs, instead of strips of adhesive plaster, an elastic loop or fillet of strong caoutchouc webbing, two inches wide, with a circumference somewhat less than that of the head, which is consequently somewhat compressed when it is applied. As the bulk of the head lessens, it is necessary to lessen also the circumference of the fillet. The treatment should be continued until the cranial bones are united. Mr. Phillips relates one case in which it was quite successful. (*Lancet*, Am. ed., Jan. 1858, p. 48.)

The operation of tapping has been employed by many, and with variable success. In some instances, temporary relief has been obtained; in others, the operation has appeared to aggravate the symptoms and hasten death; and in others again, though comparatively few, a complete cure has been effected. The operation should never be resorted to until all other measures have failed, and the case is considered desperate. The opening should be made by a small trochar, introduced perpendicularly, "at the edge of the anterior fontanel, so as to be as much as possible out of the way of the longitudinal sinus, and the great veins emptying therein. The instant that the pulse becomes weak, or the dilated pupil contracts, or the expression of the child's countenance manifestly alters, the canula should be withdrawn, and the aperture in the skull closed. Gentle compression should be carefully made to compensate, in some degree at least, the pressure that has been removed with the fluid." (*Watson's Lectures.*) Should inflammation follow, it must be treated by the usual antiphlogistic means. A case has been reported by Dr. J. M. Winn, in the *London Lancet* (Nov. 3, 1855, p. 408), in which, after tapping the head, and withdrawing seventy-two ounces of liquid, he injected two ounces of a solution of tincture of iodine, containing fourteen minims of the tincture, and then bandaged the head, with compression. It was a case of external hydrocephalus, in which the brain lay collapsed at the base of the cranium. Ten days after the operation the child died, but with little if any return of effusion. In a similar case, the same remedy was applied by Dr. Brainard, of Chicago, with at least temporary success; as the child was in good health thirty-five days after the operation. The liquid injected by Dr. Brainard consisted of about three fluidrachms of the tincture of iodine, and twice that quantity of water. The patient was two months old. (*Boston Med. and S. Journ.*, lx. 343.)

Article IV.

DROPSY OF THE CHEST, OR HYDROTHORAX.

THOUGH generally applied at present exclusively to dropsical collections in the pleura, the term hydrothorax may, from its origin (*ὕδωρ*, water, and θώραξ, chest), be appropriately extended to any case of serous effusion within the thoracic cavity; and in this enlarged acceptation I shall here employ it. There are three positions which may be severally or jointly occupied by this affection; the cavity of the pleura, that of the pericardium, and the pulmonary parenchyma.

1. *Pleural Dropsy.*

More or less serous fluid is very often found in the pleural cavities after death, without having given rise, during life, to any disturbance of health. This may be the result of effusion occurring, like copious sweats, in the dying state, or may be purely cadaveric, or may have existed unnoticed during life. To constitute dropsy, the effusion must be so considerable as to derange in some degree the healthy functions. When it exists to this extent, it produces more or less difficulty of breathing, which is increased by any bodily exertion, especially running, or ascending heights, and is greater in the horizontal than in the erect position. The dyspnœa is slight at first, but increases as the disease advances, and often becomes excessive before its close, bearing a close relation to the amount of the effused liquid. The patient lies preferably on the side most affected, generally with his head and shoulders elevated; and, in the advanced stages, is often unable to lie down at all, maintaining day and night the sitting posture. The pressure upon the lungs impedes the pulmonary circulation; and, as a consequence, the face has often a livid or purplish hue, and the lips are sometimes almost black in bad cases. This disease is often associated from the commencement with anasarca; and, when this is not the case, œdema of the face in the morning, and of the feet and ankles towards night, is very apt to make its appearance before the close.

The chest is usually more prominent at the part where the liquid is collected. The projection is often obvious to the eye, and may be demonstrated by measurement with a tape. When the effusion is very copious, the ribs are farther separated than in health, and the intercostal spaces lose their ordinary depression, and sometimes even appear to bulge outward. The heart too is displaced, being pressed towards the opposite side. It is asserted that, if the body be shaken, the agitation of the fluid may be heard; but this can happen only when there is also air in the cavity of the pleura. The vibration felt by the hand applied to the chest of an individual while speaking, is less sensible on the side affected with dropsy than on the other. Sometimes, when the effusion is very abundant, fluctuation can be perceived if one hand be laid upon the chest, and slight percussion be made by the other upon the intercostal spaces in the same vicinity. Bichat speaks of the increased dyspnœa resulting from pressure upon the abdomen as a useful diagnostic symptom. This, however, is experienced in so many other affections of the chest as to be of little value. It may assist the diagnosis when one pleural cavity only is dropsical; as the pressure produces a much greater effect when applied on the sound, than on the diseased side.

But the most certain evidences are those afforded by percussion and auscultation. There is always dulness on percussion, proportionate in a great degree to the amount of effusion. This dulness is usually first perceived in the lower part of the chest, and gradually mounts upward, with the increase of the effusion, until, in extreme cases, it extends over the whole half of the thorax, except the portion corresponding with the root of the lungs. When the effusion is less extensive, the dulness changes its position with that of the patient, and thus shows clearly that it is owing to the presence of a movable fluid in the pleura. If, for example, the instrument be applied upon the front of the chest, near the highest limit of the dulness, in the erect position, and the patient then be made to lie on his back, any decided difference between the sound emitted upon percussion, before and after the change of posture, will leave no doubt as to the existence of a liquid in the cavity.

In the early periods of the disease, the peculiar resonance of the voice called ægophony is sometimes perceived, upon applying the ear over the seat of effusion; but this disappears with the increase of the affection. The respiratory murmur is feeble at first, and at length ceases to be heard, in some bad cases, over almost the whole chest. But, unless the collapse of the lung is complete, if the patient be placed upon his face, both ægophony and the respiratory murmur may be sensible in the posterior part of the chest, when they have ceased anteriorly.

The only affections with which pleural dropsy is likely to be confounded are consolidation of the lung from pneumonia or other cause, and the presence

with these, the liquid effused may be merely serum, and, therefore,
continued, entitled to be considered as dropsical. Empyema is more
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to assign a good reason for the distinction. When the effusion is simply serous, it must be considered dropsical whatever may be its origin. The cases considered as idiopathic hydrothorax are probably, in most instances, the result of a high irritation of the membrane, which has not reached the point of inflammation simply because the blood-vessels have relieved themselves by effusion. Sometimes the disease results from a sudden transfer of the morbid process, whatever it is, from the areolar tissue to the pleura; the anasarca disappearing as the hydrothorax occurs.

In relation to the *treatment*, little need be added to what was said under general dropsy. When there is reason to believe that the effusion depends upon an inflammatory condition of the pleura, very great advantage may be expected from occasional cupping, and repeated and long-continued blistering. Of the internal remedies, perhaps most reliance is to be placed upon a combination of squill and calomel; the latter being carried to a slight ptyalism. Paracentesis may be resorted to with hope of benefit, when there is reason to believe that the disease has originated in inflammation or mere vascular irritation of the pleura. In other cases, it would be a desperate resort, at best calculated to afford but temporary relief at the hazard of producing fatal inflammation. Nevertheless, when the danger of death from suffocation is imminent, the practitioner would be justified in resorting to it as a temporary expedient. In no case should it be employed until other means have failed.

2. *Pericardial Dropsy.—Hydropericardium.—Dropsy of the Heart.*

A certain quantity of serum in the pericardium does not appear to be incompatible with health; at least, it is frequently found after death, without any previous symptoms that could have led to a suspicion of its existence. As in the pleura, the probability is, that the effusion is partly an attendant on the last agony, or merely cadaveric; but it can scarcely be doubted that, in many cases, it has existed during life. How much may be considered as constituting disease cannot be exactly determined; for the effects from the same quantity vary greatly with the rapidity of its accumulation. A small portion effused quickly will embarrass the heart more than a much larger quantity collected slowly, so as to allow that organ to be gradually accustomed to its presence. Corvisart considered six or seven ounces as on the average sufficient to indicate a morbid state; and it is probable that less will sometimes interfere with the circulation and respiration.

As in pleural dropsy, there is much difficulty in distinguishing the symptoms produced by the effusion from those of coexisting diseases, especially of the heart; and not unfrequently the same symptoms have their origin in both affections. Besides, hydropericardium is frequently associated with dropsy of other cavities, or with general dropsy, which very much complicates the phenomena. A small, feeble, irregular pulse, dyspnœa, inability to retain the horizontal position, a livid or purplish hue of the face, deepest in the lips, and sometimes extending to the arms, are symptoms which result from dropsy of the pericardium; but they also frequently exist in disease of the heart without this complication. Corvisart pointed out a characteristic symptom, observable in some rare cases of very copious effusion. In two instances of this kind, the heart could be felt beating at different spots at different times; the pericardium being so much distended as to allow that organ to float about in the liquid with which it was surrounded, in obedience to any impulse which it might receive. An elevation of the point at which the heart's pulsation is felt, and its removal further towards the left, are other occasional signs of pericardial effusion. A preternatural prominence of the thorax in the region of the heart, obvious to the eye, and œdema of the face and extremities, are still more important signs. But no certain evidence of the existence of the of pus or blood in the cavity. From the former, dropsy may be distinguished, in moderate cases, by the changing position of the dulness and the auscultatory signs, with the change of posture by the patient; and, in severe cases in which the whole cavity is full, by the obvious expansion of the chest, the enlargement of the intercostal spaces, and the effacing of their regular depression. Besides, in pneumonia percussion is not usually so flat as in dropsy, the respiratory sounds are not so distant, the vibratory movement of the chest is increased instead of being diminished, and the condition of the sputum is quite characteristic. Empyema is distinguished with greater difficulty. The diagnostic signs of this affection are chiefly such as indicate the previous or coincident existence of inflammation; though it is not impossible that, even with these, the liquid effused may be merely serum, and, therefore, if long continued, entitled to be considered as dropsical. Empyema is more apt than dropsy to be confined to one side, and is much less apt to be accompanied with œdema of the face and extremities. Should the signs exist of a communication between the cavity of the pleura and the lungs, the effusion may be looked on as certainly purulent. The existence of blood in the pleural cavity may be inferred, if the effusion has succeeded any violence, or has come on suddenly in cases of a hemorrhagic tendency, as in purpura and scurvy.

Pleural dropsy is often only a portion of general dropsy, and is, in most instances, associated with more or less anasarca. Occasionally, however, it exists alone; and this is especially the case when it arises from inflammation or active congestion of the pleura. Under the same circumstances, it is sometimes confined to one side; but more generally it exists in a greater or less degree in both cavities. In the latter case, however, it is very frequently in a greater degree upon one side than the other. When arising from disease of the lungs, it occurs most frequently on the affected side, and when from disease of the heart, according to Dr. Williams, upon the right side. Its course is very uncertain. Sometimes it comes on suddenly, and soon proves fatal; but much oftener it is chronic, lasting for a long time, sometimes better and sometimes worse, now yielding to treatment, and again returning, until at length the patient succumbs, either under the disease in which the dropsy originated, or from the effects of the dropsy itself. When originating from a general dropsical diathesis, or from a mere irritation of the pleura, it is often radically cured. Not unfrequently, however, it ends in death, because dependent upon incurable affections.

Upon examination after death, the lung is found more or less compressed, and forced inward and backward toward the mediastinum and spine. Occasionally old partial adhesions of the pleura are observed to restrain, in some measure, this change of position. In very bad cases, the bronchial tubes appear almost entirely obliterated, and the lung had evidently quite ceased to admit air in respiration before death. But, even in such cases, it expands if air be blown into it through the trachea. The pleura is often quite free from disease, but sometimes exhibits traces of preceding inflammation. The liquid is sometimes limpid and colourless, but more frequently yellowish or brownish, or tinged with blood, and occasionally offers flakes of coagulated fibrin or albumen, or is turbid from a similar impregnation. The quantity is exceedingly variable. It generally amounts to several pints, sometimes in bad cases to one or even two gallons, though the last-mentioned quantity is very rare.

The *causes* of pleural dropsy do not differ from those of the general disease. It originates most frequently in organic affections of the heart, the great blood-vessels, or the lungs, and is apt to be associated with tubercles in their earlier stages. As in all other forms of dropsy, the effusion may depend upon inflammation of the secreting membrane. Some authors consider the serous effusion arising from this cause as distinct from dropsy; but all to assign a good reason for the distinction. When the effusion is simply serous, it must be considered dropsical whatever may be its origin. The cases considered as idiopathic hydrothorax are probably, in most instances, the result of a high irritation of the membrane, which has not reached the point of inflammation simply because the blood-vessels have relieved themselves by effusion. Sometimes the disease results from a sudden transfer of the morbid process, whatever it is, from the areolar tissue to the pleura; the anasarca disappearing as the hydrothorax occurs.

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This form of dropsy, when dependent on inflammatory irritation of the pericardium, or on a general dropsical diathesis, is susceptible of cure; but too frequently it is quite incurable, in consequence of the irremovable nature of its cause; and it is generally of this character when very copious.

The liquid is found on dissection very similar to that effused in pleural dropsy. The quantity is sometimes very considerable; and a case is on record in which eight pounds were extracted. The pericardium sometimes exhibits signs of former inflammation; but frequently it is entirely free from them; being paler than usual, and otherwise differing from the normal state only by an occasional greater thickness, consequent, as is not unfrequently the case with other hollow structures, upon the stimulus of distension.

In relation to the causes of pericardial dropsy, it is scarcely necessary to add anything to what has been already stated. In its serious forms, it is most frequently the result of disease of the heart, great blood-vessels, or lungs. It has been traced also to a tuberculous condition of the pericardium. As the other kinds of dropsy, it may depend upon simple irritation of the membrane, or upon those conditions which give rise to general dropsy.

Nor is there anything peculiar in the treatment. The therapeutical remarks on dropsy of the pleura are applicable to this affection. Paracentesis, however, must be resorted to with even greater reserve. Still, it would be justifiable, should life be in imminent danger, after all other measures had been tried ineffectually. No case, I believe, is on record of a favourable result of the operation in pericardial dropsy.

3. *Pulmonary Œdema.—Dropsy of the Lungs.*

This name is applied to serous effusion in the parenchyma of the lungs. It may occupy the extra-vesicular areolar tissue, or the air cells, or both. When considerable, it occasions great dyspnœa, hurried breathing, and frequently cough, with the copious discharge of a thin, colourless, frothy liquid. There is more or less dulness upon percussion, which is most evident when the two lungs are unequally or one exclusively affected, the contrast between the two rendering the want of resonance in the dropsical lung more obvious. The respiratory murmur is diminished, but not altogether lost, unless in parts of the lungs in bad cases. Both the dulness on percussion, and the indistinct-the respiration, are most decided in the lower and back portion of the There is a subcrepitant rale during inspiration, resembling that of ›nia, but not so fine, and attended with the mucous rale, indicative of n the larger bronchia. The affection is very frequently accompanied ma of the face or extremities, and even general anasarca.

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affection is sometimes rapid, and terminates fatally in a few days; but ·equently it is chronic, and runs a long and variable course, together ıe diseases of which it is a part or an effect. It may frequently be when dependent on causes which are not themselves irremediable.

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causes of œdema of the lungs are the same as those of dropsy in gene-l need not be repeated here. It not unfrequently accompanies pleural ; and is apt to be found in old cases of disease of the heart with ane-nptoms. There is nothing special in the treatment. If curable, it will › the diuretics, purgatives, &c. employed in general dropsy.

Article V.

ABDOMINAL DROPSY.

term ascites is now confined to dropsy of the peritoneum. Serous within the abdomen often produce great distension, and imitate ascites e of its most prominent symptoms; but they constitute a different affec-aving a different origin, and requiring a different treatment. They are designated as *encysted dropsy*, or, when connected with the ovaries, *n dropsy*. Though not strictly belonging to the present category in ›ct nosological arrangement, they will be most conveniently considered place, from their apparently close relation to ascites.

1. *Ascites.*

ı is a frequent form of dropsy; but my own observation does not accord ıat of the authors who make it the most frequent. It commences usu-ith an uneasy feeling of fulness in the abdomen, to which the attention patient is first called by finding his clothes too tight. The distension observable in the lower portion of the abdomen when the patient is in ›st position, and disappears when he lies down. But it gradually extends, and, when the complaint is at its height, the whole belly is uniformly, and often very greatly swollen. The character of the tumefaction is known by the wave-like impulse imparted to the hand placed in contact with the side of the abdomen, when slight percussion is made with the fingers of the other hand upon the opposite side. The sensation produced is quite distinctive, and can scarcely be mistaken. But, when the quantity of water is very small, the fluctuation cannot be made sensible in this way. In such a case, it is sometimes rendered evident, in the manner recommended by M. Tarral, by making slight percussion a few inches only from a finger placed upon the abdomen, or by applying the thumb and middle finger of the same hand upon the surface, and percussing by the index finger between them. The sound, moreover, yielded by percussion aids the diagnosis. This is flat over the region where the liquid is collected; and the extent of the liquid may sometimes be measured by the extent of the dulness; as the portions of abdomen unoccupied by it are resonant in consequence of the presence of air in the intestines. When the effusion is slight, the liquid may sink wholly in the pelvis, in the erect position, so as to escape notice whether by the fluctuation or dulness on percussion. In such a case the patient should lie on his right side, with the pelvis somewhat elevated. The liquid is thus made to fall into the side, and substitutes flatness on percussion for the natural resonance of the colon. (*Ballard.*) As, in consequence of the air contained in them, the bowels are specifically lighter than the liquid, those portions which are loose have a tendency to occupy the part of the abdomen that is uppermost. Consequently the resonance will be strongest over the upper part of the cavity in the erect position, and about the umbilicus when the patient is on his back. Exceptions to the latter statement will be found in the instances, noticed by Dr. Watson, in which the bowels are bound down to the back of the abdomen by adhesions, or in which the distension is so great that the attachments of the intestines are too short to allow them to reach the surface of the liquid. Another diagnostic character is the swelling or bulging out of the sides of the abdomen, with depression of the anterior surface, in the supine position. Sometimes anasarcous swelling of the walls of the abdomen is so great that it might readily, without caution, be mistaken for ascites, especially as it sometimes causes a sense of obscure fluctuation when the blows are gentle. But attention to the possibility of such an error is sufficient to prevent it.

Besides the characters enumerated, the disease is attended with various symptoms, either belonging to dropsy in general, or the result of the organic derangements in which it originates. Of the former, are frequently thirst, scanty urine, a dry skin, more or less edematous or anasarcous swelling, and, when this is absent, general and sometimes extreme emaciation. The latter vary, of course, with the organic affection, and do not require to be mentioned here. Various functional disturbances result from the great mass of the effused fluid. Not to speak of the disagreeable feeling of distension and weight, and the inconvenience of movement, the patient often experiences great dyspnœa from the upward pressure of the diaphragm; nausea, colicky pains, and flatulent disturbance from the compression of the stomach and bowels; and, in the advanced stages, anxiety, occasional disposition to faintness, and feeble irregular pulse, from interference with the action of the heart. The tumefaction of the abdomen often becomes enormous; and is sometimes apparently increased by an anasarcous condition of the parietes. The veins on the surface of the abdomen are much enlarged, in consequence of the compression of the venous trunks within. Occasionally, the skin at the umbilicus is stretched and everted so as to form a small projecting pouch. Instances have occurred, in which the skin of the pouch alluded to has ruptured, and the fluid been discharged externally. A communication has also been known to take place be-ween the cavity of the abdomen and bowels, so as to allow the escape of the liquid in this direction. In unfavourable cases, the debility becomes at length extreme, the action of the heart fails, drowsiness sometimes occurs, and the patient dies from syncope, or with symptoms of oppressed brain.

Dissection often exhibits a bleached appearance of the abdominal contents, as if from maceration in the effused liquid. Evidences of former peritonitis are also often presented, in whitish opaque or thickened patches, a granulated surface, various abnormal growths upon the membrane, and adhesion and bands from organized fibrin. The liquid is of various character; transparent and colourless, or turbid and either whitish, brown, or reddish, with albuminous flakes or purulent admixture; thin or viscid like syrup, or almost gelatinous; and sometimes fetid. The quantity differs from a few pints to several gallons.

The affections with which ascites might possibly be confounded are pregnancy, tympanites, an enormously distended bladder, and encysted dropsy.

In ordinary cases of pregnancy there can be no difficulty. But when the uterus, as sometimes happens, is greatly distended with serous fluid, so as to impart a decided sense of fluctuation to the hand, or when pregnancy is complicated with ascites, the diagnosis is occasionally embarrassing. In pregnancy, however, the abdomen remains more prominent when the patient is on her back, and does not so much bulge out laterally; the uterus, rising up anterior to the intestines, renders percussion dull at the umbilicus in the same position; and, when ascites coexists, the fluctuation is more distinct in the upper portion of the cavity, at the hypochondria, for example, than in the lower portion which is occupied by the womb. Some aid may also be derived from the history of the case, and the presence or absence of the menses; though the frequent suppression of this discharge in dropsy may deprive the sign of its value. The detection, by means of the stethoscope, of the action of the fœtal heart would be quite decisive. Should other methods fail, an examination per vaginam by an experienced accoucheur would settle the question. After all, however, it is not so much the difficulty of the diagnosis, as the liability to form a hasty decision, without particular examination, and from the mere statements of the patient, that requires notice. Ludicrous, if not serious mistakes, have sometimes resulted from a want of thought on the part of the practitioner.

Nothing is easier than the diagnosis between dropsy and pure tympanites. The absence of fluctuation, and the universal resonance in the latter affection are sufficient distinctions. But the two affections are often complicated, and in such a manner as to render it somewhat difficult to decide how much of the distension is tympanitic, and how much dropsical. The late Prof. Chapman had known ascites so often preceded by tympanitic distension as to have suggested to him the idea, that an aeriform secretion is sometimes converted into a liquid. (*Am. Journ. of Med. Sci.*, i. 161.) The relative degree of fluctuation, and of resonance on percussion must decide the question as to the relative amount of liquid and air present. Fluctuation, and flatness on percussion must be sought for in the most depending parts of the abdomen.

In relation to the distended bladder, it is only necessary that the young practitioner should be alive to the possibility that it may be mistaken for ascites, and to the fact that such a mistake has been made, in order to avoid it. The history of the affection, its attendant symptoms, the regular outline of the dulness in the lower part of the abdomen, and the pain on pressure, would sufficiently distinguish the distended bladder; and, if there should still be doubt, it would be at once removed by the introduction of the catheter.

The diagnosis between ascites and encysted dropsy will be given, when the latter affection is considered. It is said that the dropsical effusion is sometimes confined to the inner laminæ of the omentum, and that a large sac has been formed by the unfolding and dilatation of its cavity. But such cases are extremely rare, and known only after death.

It is often important to decide, in cases of abdominal dropsy, whether it has arisen from organic derangement, and if so, what is the nature of that derangement. In forming his judgment, the practitioner will be guided by the symptoms, mingled with those peculiar to dropsy, which characterize the various affections that give origin to this disease. A careful examination of the abdomen will often throw light upon the subject. From abnormal hardness under the hand, circumscribed dulness on percussion, tenderness upon pressure, movements within the abdomen corresponding with changes in the position of the body, even from irregularities in the outline of the abdomen, the practitioner will be enabled occasionally to draw important inferences as to the existence of an enlarged or indurated organ, or some morbid structure, concerned in the causation of the disease. Dr. Watson speaks of a sensation experienced when sudden pressure is made by the points of the fingers in a direction perpendicular to the surface, a sensation neither to be described nor mistaken, as of the displacement of a liquid, and the impinging of the fingers upon a solid substance. This is a valuable aid in the detection of enlargement of the liver or spleen, ovarian tumours, and other morbid growths complicated with ascites. The same result may be obtained, in cases of movable tumours, by putting the patient into such a position that his abdomen shall be dependent, and pressing quickly upward with the ends of the conjoined fingers. The presence of a solid body within the cavity is rendered obvious by the sensations produced.

Causes.—In relation both to the pathological condition and causes of ascites, there is little to be added to what has been said on general dropsy. When connected with pathological conditions of a general nature, or dependent on causes having a general action, such as debility, a morbid state of the blood, and organic affections of the heart and kidneys, it is most commonly associated with external œdema or anasarca. It is less frequently than anasarca of renal origin. When unaccompanied with dropsical effusion elsewhere, it depends, for the most part, either on a special irritation or inflammation of the peritoneum, or upon some impediment to the portal circulation, inducing venous congestion of all the abdominal viscera. The latter is the most frequent origin of exclusive ascites. That it occasionally arises from peritoneal inflammation is proved by the abdominal pain and tenderness, and the febrile symptoms, which have sometimes been observed to precede its appearance, and by the phenomena exhibited upon dissection. It is more frequently the result of chronic than of acute inflammation. It is probable that tubercles in the membrane itself, and various abdominal tumours sometimes occasion ascites by sustaining an irritation or inflammation of the peritoneum. The same causes may also act by impeding the flow of blood in the ramifications of the veins, and thus inducing congestion. Obstruction or remora of the portal circulation may arise from a stricture of the vena portarum, or a diminution of its caliber in consequence of pressure from without it. This is most frequently met with in the liver, and hence hepatic disease is generally recognized as the most frequent cause of ascites. Enlargement of the liver from chronic inflammation or degeneration, cirrhosis, scirrhus, and tubercles, all produce it. Those conditions of the viscus are most effective which pervade its whole substance, and consequently everywhere compress the ramifications of the portal veins. Hence, cirrhosis is one of its most frequent and fatal causes. The enlarged spleen and mesenteric glands, scirrhus of the pylorus, diseased pancreas, and other tumours may possibly act in the same way, by diminishing the capacity of the portal vein or its tributary branches; but, as before stated, they probably act also quite as much by sustaining irritation of the peritoneum.

Prognosis.—Ascites, when dependent upon the same causes as external dropsy, and associated with it, is very often cured. When it exists exclusively, it is apt to be much more obstinate, because connected with affections of an intractable or incurable character. But, even in this form, those writers go too far who affirm that it rarely gets well. It is true that, in very many cases, it is altogether unmanageable, and ends sooner or later in death. It is true also that, even in cases in which the fluid may be removed by general treatment, it often returns, because the root of the disorder has not been reached. But, nevertheless, instances of recovery are not uncommon. They have repeatedly occurred within my own observation. This result may be looked for with some confidence when the effusion depends upon simple peritoneal irritation from checked perspiration, repelled eruptions, &c.; and it not unfrequently happens in cases of tumefaction of the liver, from simple chronic inflammation. Occasionally a spontaneous cure takes place by the re-establishment of the urinary secretion, or the occurrence of copious discharges from the skin or bowels. A case is recorded in the *London Lancet* (March, 1842), in which a radical cure was effected by profuse sweating from the abdomen, which came on spontaneously. M. Dalmas witnessed the cure of ascites, in an infant, from the rupture of a pouch which had formed at the umbilicus. (*Dict. de Méd.*, iv. 202.)

Treatment.—This is to be conducted according to the plan detailed under general dropsy. Perhaps the most efficient remedies for the removal of the fluid are the hydragogue cathartics. Elaterium will sometimes act like a charm. But the debilitating effects of purgatives cannot always be borne, and it is necessary to resort to the diuretics. Bitartrate of potassa often answers an admirable purpose. But, whatever remedy is employed for the evacuation of the serum, it is often essential to conjoin with it the use of mercury, especially when the disease originates in chronic inflammation of the liver. The mercurial should be cautiously employed, so as but slightly to affect the gums, and should be persevered in for a long time, occasionally for months. Some recommend, under similar circumstances, the use of iodide of potassium; but this should never be relied on to the exclusion of mercury. Frictions with iodine ointment daily, or twice a day, over the region of the tumefied liver, may be employed. When the liver is affected with tubercles, cancer, or cirrhosis in its advanced stage, little good can be expected from these or any other remedies; but, in the uncertainty as to the precise condition of that viscus, it would be best to give the mercurial a fair trial, in the hope that the affection might be of a nature amenable to its influence.

Dr. Christison and other practitioners of Edinburgh, imitating the practice of MM. Brera and Chrestien, of Montpellier, have made use of digitalis externally with great benefit. A convenient mode of using it is to apply over the abdomen a cloth of spongy texture, soaked with an infusion of the leaves, made in the proportion of one ounce to twenty fluidounces of boiling water. The cloth should be worn steadily, and the evaporation of the liquid may be prevented by a covering of oiled silk. Its diuretic effect is usually produced in a few days. (*Ed. Month. Journ. of Med. Sci.*, Oct. 1850, p. 312.)

If symptoms of inflammation exist, cups and blisters to the abdomen should be resorted to; and a large blister will sometimes be found advantageous under other circumstances. The remedy, however, should not be used in cases of great debility, or enormous anasarcous distension, for fear of gangrene.

Well regulated compression of the abdomen by means of bandages has sometimes been of undoubted advantage. It is applicable to the earlier stages, before the distension has become so great as much to embarrass respiration. Dr. Gerhard has found this remedy, combined with the warm bath, very effectual. (*Med. Exam.*, v. 209.) According to Dr. Dubini, in cases not encysted, and not attended with edematous extremities, it will, in the majority of instances, remove not only the effused liquid, but its cause; and he has often succeeded admirably with its aid, in cases in which remedies had previously been ineffectual. (*Braithwaite's Retrospect*, Am. ed., xxi. 32.)

Tapping has been much employed, and various opinions have been expressed of its advantages. While some allow it only as a last resort, merely to obtain temporary relief when all ordinary means have failed, others have recommended it as a remedy, capable, in some instances, of effecting cures. There can be no doubt that permanent cures have, in some rare cases, followed this operation; and the opinion held by some, that, by removing pressure from the kidneys, it favours the action of diuretics, is probably not entirely without foundation. Nevertheless, it very generally fails to do more than yield temporary relief; and the liquid accumulates again, often even more rapidly than before, so as to render a frequent resort to the operation necessary. The quantity of serum which has been drawn off, and the number of times that tapping has been repeated in some instances, are astonishing. In a case of Störck's, twelve and a half gallons were evacuated at one operation: Dr. Beall, of Missouri, records a case, in which the operation was performed ninety-six times in the course of a few years, and the whole amount drawn off was two hundred and seventy-five gallons and a half; and a case was reported by M. Lecanu to the Paris Royal Academy of Medicine, in which a woman was tapped eight hundred and sixty-six times, and ultimately recovered under compression of the abdomen. (Dunglison's *Notes to Cyc. of Pract. Med.*) Nor is paracentesis without danger. Leaving out of the question the instances in which the intestines or uterus have been wounded, and an artery divided, there is occasional danger from inflammation of the peritoneum, and the operation has repeatedly been followed by fatal effects. It is probable, moreover, that in most of those cases in which cures have followed it, the same result might have been obtained from other treatment. On the whole, it seems advisable to resort to paracentesis only when it becomes necessary, from the failure of purgatives, diuretics, compression, &c., to afford the patient relief from great oppression, or to postpone for a period the fatal termination. In the performance of the operation, it is important, as the fluid escapes, to make compression of the abdomen by means of a bandage, so as to supply artificially the pressure upon the viscera to which the patient has been so long habituated, and the sudden withdrawing of which has repeatedly proved fatal when this precaution has been neglected.

The evacuation of the fluid by means of acupuncture has been recommended, and is said to have been sometimes very successful. It is stated that the fluid escapes from the cavity of the peritoneum into the external areolar tissue, and is there absorbed. Dr. Pritchard employs a grooved needle, and has found it less painful than the ordinary trochar, and not less effectual. But for particulars as to the mode of performing the operation, the reader is referred to the works upon surgery.

The plan of injecting stimulants into the cavity of the abdomen, as in the radical cure of hydrocele, has been recommended; but the hazard of fatal inflammation, in ordinary cases, greatly overbalances the prospect of benefit. A pupil of the author, however, Dr. John B. Sherrerd, formerly of Belvidere, New Jersey, recorded, in his inaugural essay (January, 1845), a case of apparently desperate abdominal dropsy in a female, in which Dr. Clark, of the same place, after tapping, injected a decoction of oak bark into the cavity of the abdomen, with the result of effecting a perfect cure. A case was reported by M. Leriche, of Lyons, in which the injection of an ounce of tincture of iodine, and a drachm of iodide of potassium, with eight ounces of water, into the abdominal cavity, immediately after tapping, in a case of ascites, was followed by recovery (*Med. Times*, May 29, 1847); two other cases were afterwards treated successfully, in the same way, by the same practitioner (*Arch. Gén.*, *4e sér.*, xxiii. 78); and the operation has since been repeatedly performed by different practitioners with variable results. M. Boinet relates the case of a lady of about thirty, in which the iodized fluid was injected into what was supposed at the time to be an ovarian cyst. Intense pain was produced, followed by severe suppurative peritonitis, showing that the cavity of the peritoneum had been penetrated, and that the case was one of ordinary ascites, and not ovarian dropsy. The patient was in imminent danger; repeated punctures were necessary to discharge the pus; but happily at length a complete and permanent cure was effected. (*Gaz. Hebdom.*, Janv. 6, 1860, through the *Am. J. of Med. Sci.*, July, 1860, p. 251.) Dr. E. P. Bennet, of Danbury, Conn., succeeded in curing a case, in which the abdomen was filled with a gelatinous matter, by making an incision three inches in length below the umbilicus, removing the matter, then washing out the cavity thoroughly with warm water, injecting four ounces of tincture of iodine, and, after this had escaped, introducing a leaden tube so as to maintain a fistulous opening. (See *Am. Journ. of Med. Sci.*, April, 1857, p. 556.) M. Tessier recommends that the cavity should not be emptied before the injection of the iodine, which is thus, by its diffusion through the liquid, prevented from acting too powerfully. If, however, the abdomen is very much distended, he performs a preliminary tapping, in order to diminish the extent of surface. He varies the strength of the injection according to the alkalinity and albuminosity of the liquid, throwing in from five drachms to an ounce of the tincture of iodine and half a drachm of iodide of potassium, when the liquid is clear and but slightly alkaline or albuminous, and twice the quantity when it is decidedly otherwise. (*Gaz. Méd. de Paris*, Avril 22, 1854.) The operation should not be performed so long as there is any chance of relieving the patient by other methods, and is contraindicated when the abdominal dropsy depends on causes acting upon the system at large, or through the heart, kidneys, or liver.

2. *Encysted Dropsy.—Ovarian Dropsy.*

In this affection, the liquid, instead of occupying the cavity of the peritoneum, is contained in cysts morbidly developed within the abdomen, and gradually increasing in size until tumefaction becomes obvious to the eye, and fluctuation is discoverable upon examination in the usual manner by the hand. These cysts are produced either in the substance or upon the surface of the organs, and are supposed sometimes to originate as hydatids. Their most common attachment is to the ovary, or some of the uterine appendages, as, for example, to the broad ligaments; and, in such cases, the name of *ovarian dropsy* is applied to the affection.

The cysts which spring from the ovary are either the morbidly dilated Graafian vesicles, or new formations within the substance, or upon the surface of that organ. In some instances, it seems as if the whole ovary had undergone this process of dilatation, and been converted into a sac with numerous cells. The cyst has sometimes only a single cavity, sometimes several, which may either communicate or be quite distinct; and occasionally it appears to consist of two or more distinct sacs which have coalesced. It may either be unconnected, except at the place of its origin, or may have formed adhesions with the contiguous structures. The cyst sometimes attains an enormous magnitude. Cases are on record in which the fluid contents are stated at from 100 to 120 pounds, and one in which the cyst is affirmed to have measured six feet in circumference. The contents are exceedingly diversified in colour and consistence. They may be colourless, yellowish, brown, or milky; limpid like water, or turbid; thin and serous, or slimy, ropy, and gelatinous. They are described also as occasionally puruloid, bloody, oleaginous, even cretaceous or cheesy in consistence, and variously resembling the lees of wine, coffee-grounds, and molasses. It sometimes happens that the different cells of the same cyst have different contents.

The affection is usually slow in its progress, and for a long time attended with little disturbance of the general health, though the menses are often irregular, and, when both ovaries are affected, are said to be almost invariably suppressed. Sometimes it continues for thirty years or more before it terminates fatally, and persons affected with it not unfrequently attain a tolerably advanced age. But, in other instances, it is much more rapid in its progress, and destroys life in a few years. This is said to happen most frequently when it attacks the young and robust. The age at which it is most common is about that of the cessation of the menses. Married women are said to be more frequently attacked than the single; but this difference may be only apparent, and dependent on the much greater number of the former. Dr. Magnus Huss, of Stockholm, has recorded a case in which ovarian dropsy seemed to be periodical, at first appearing in the interval of the menses, and disappearing at the time of the flow, and ultimately, though never entirely absent, yet increasing and diminishing under the same circumstances. (*Arch. Gén.*, Juillet, 1857, p. 1.)

In its advanced stages it is apt to be attended with œdema of the extremities, consequent on the interruption of the venous circulation by the bulk of the tumour. It may prove fatal by impeding respiration, by exciting peritoneal inflammation, or by an inflammatory action in the cyst itself, ending sometimes in suppuration, ulceration, and fistulous openings. Occasionally the cyst opens externally, occasionally into the cavity of the peritoneum; in either case generally terminating unfavourably, though spontaneous cures are said to have resulted in some rare instances of this kind. In one instance, the cyst was ruptured from external violence, and its contents poured into the peritoneal sac, where they were absorbed, and the patient recovered.

In other cases of encysted dropsy, the cyst springs from the *liver*, *spleen*, or some other portion of the peritoneal surface. In this case, it often probably originates in hydatids. I once witnessed the post-mortem examination of a case of this kind, in which the abdomen had become, in the course of many years, enormously distended, and, upon being opened, was found filled with numerous cells of various sizes, the walls of which were in every stage of development, from the state of delicate translucent membrane to that of a thick, rough, opaque, fleshy structure; and, in some of the cells, small transparent hydatids were found of various magnitude.

Diagnosis.—The most important point for the practitioner, in relation to encysted dropsy, is to be able to form a correct diagnosis between it and proper ascites. This is not always easy when the former affection is in an advanced stage, and the cyst single, and distended so as to fill the abdominal cavity. But in general there is little difficulty. At an early period the distension, as well as the dulness on percussion, is confined to one portion of the abdomen; being observed, in ovarian dropsy, in the iliac fossa upon one side, and, when the cyst is of hepatic origin, in the upper part of the cavity. When the cyst is loose, it varies its position somewhat when the patient moves from side to side; but does not spread out uniformly, like free liquid, in obedience to the laws of gravitation. In ascites, the distension is first observed in the pubic region in the erect posture; but, in the recumbent, passes to the back portion and sides, which, when the effusion is considerable, swell outward, while the prominence of the abdomen is depressed. This lateral distension on both sides is not observed in encysted dropsy. In the advanced stage of the latter affection, the surface of the abdomen is generally uneven and somewhat tuberculated, from the unequal development of the cells of the cyst. The fluctuation is usually much more obscure than in ascites. But percussion affords, perhaps, the best means of diagnosis. In encysted dropsy, particularly the ovarian, the intestines are pushed to one side, or crowded into the back part of the abdomen; while, in ascites, they float on the top of the liquid. Hence, in the former, the percussion will be dull upon one side and in front of the abdomen, while it may be resonant on the other side, and will generally be so in the back of the abdomen. In the latter, the resonance should be in the upper part of the abdomen when the body is erect, upon the anterior surface about the umbilicus when it is horizontal. Exceptions to the latter fact are the instances, before alluded to, in which the distension is so great that the intestines cannot reach the surface, or in which the bowels are bound to the back part of the abdomen by adhesions.

Some value also belongs to the constitutional symptoms. In encysted cases there is, for a long time, little of that disturbance of the functions which usually attends dropsy. There is, for example, no peculiar thirst, dryness of the skin, or scantiness of urine. The patient retains a better appetite, and undergoes less emaciation than in ascites. The inconvenience arises chiefly if not exclusively from the mere distension.

Treatment.—Little need be said upon this point. All the remedies found useful in dropsy have been tried in this affection, and proved of little avail. The object of the practitioner should be to render the patient as comfortable as possible. Inflammation in the sac will be obviated by leeches, blisters, fomentations, emollient poultices, and cathartics, while the pain will be relieved by anodynes. Sometimes a gentle mercurial course may prove useful; and the preparations of iodine have been recommended. Frictions with iodine ointment over the tumour, steadily persevered in for a long time, may possibly be productive of benefit. When the distension becomes very great, and exceedingly inconvenient if not dangerous, tapping may be resorted to. The operation must be performed in the centre of the most prominent portion of the abdomen, unless there may be reason to fear the division of an artery. This is necessary in consequence of the frequently cellular character of the cyst. But the operation is not without danger, and is never more than palliative, requiring in general to be frequently repeated, as the cavity rapidly fills up. The dangers are of effusion into the peritoneal cavity, of inflammation of the cyst itself, of wounding some important organ, or of opening an artery. The operation should not, therefore, be inconsiderately resorted to. In some cases, cures take place in consequence either of the bursting of the cyst from violence, and the absorption of its contents, or of inflammation of its inner surface, correcting the tendency to secretion, or giving rise to adhesion of its surfaces, and obliteration of the sac. Mr. Bainbridge, of Liverpool, effected a cure of this affection by making an incision into the cyst through the abdominal parietes, and keeping it open by means of a plug until suppuration was established; and he subsequently published the history of eighteen cases, which had been treated successfully by various practitioners upon the same principle. (See *Am. Journ. of Med. Sci.*, N. S., xiv. 231.) In 1846, Dr. Allison, of Spencer, Indiana, cured a case of ovarian dropsy by injecting a solution of iodine into the sac. (*Med. Examiner*, N S., iii. 459.) Dr. Simpson, of Edinburgh, afterward repeatedly performed the operation, employing the undiluted tincture of iodine of the Edinburgh Pharmacopœia, of which two or three ounces were usually thrown into the cyst. No serious constitutional symptoms followed, and in general little pain was suffered. In two or three cases the operation appears to have been successful; but it failed in a large proportion. (See *Am. Journ. of Med. Sci.*, N. S., xxviii. 259.) In October, 1852, Dr. Boinet addressed a memoir on the subject to the French Academy of Medicine, in which he recommended the operation as always safe if properly performed, often successful in the cure of the affection, and, when this cannot be effected, always palliative. (*Arch. Gén.*, 4e sér., xxx. 483.) Two cases, however, have been reported in the *London Medical Times and Gazette* in which it proved fatal (Feb. and Nov. 1857, pp. 138 and 508); and two others have since been recorded, one by M. Demarquay (*B. & F. Med.-chir. Rev.*, April, 1862, p. 553), [illegible] by Dr. Löwenhardt, of Prenzlau (*Am. J. of Med. Sci.*, April, 1841, [illegible] 493.) in both of which death apparently resulted from the severe shock on the nervous system. The question of the extirpation of the sac is so purely surgical that I do not propose to discuss it here. Though often fatal, the operation has, in not a few instances, proved successful, and rescued the patient from a disease which would otherwise have sooner or later caused death.

SUBSECTION II.

DISEASES OF THE SKIN.

The diseases of the skin described by medical writers are very numerous. Almost every diversity of morbid action in this tissue is obvious to examination; and various affections, which, judged of by their general effects alone, would appear identical, exhibit to the eye sufficient evidence of diversity to authorize or require a distinct consideration. Were the diseases of the mucous membranes susceptible of the same close inspection, they might possibly be found equally numerous. Perhaps authors have carried their nicety of discrimination somewhat too far in relation to cutaneous affections; as the multiplicity of names and distinctions tends to embarrass the learner, without always being of practical advantage. The treatment is governed not so much by trivial differences in the appearance of an eruption, as by the condition of the system, and intimate nature of the disease, which are not unfrequently the same, when the obvious phenomena differ. In the following remarks, therefore, I shall lay little stress upon many of the varieties which have been described, though I may deem it proper to notice them.

But many of the cutaneous affections will be omitted in this place. Certain functional derangements, such as excessive and deficient perspiration, and morbid heat and coldness of surface, occur almost always as symptoms of other diseases, to the history of which, therefore, an account of them properly belongs. Several highly important diseases of the skin are merely parts, though essential parts, of certain febrile movements; and, therefore, fall into the division of idiopathic fevers. Such are all the febrile exanthemata, as scarlatina, measles, small-pox, and not unfrequently erysipelas. Again, there are many skin disorders which are usually treated of in surgical works, the consideration of which in works on the practice of medicine would be useless repetition. Such are local erysipelas, furuncles, anthrax, cancer, and the different external developments of syphilis. All these will be omitted.

In the classification and nomenclature of complaints of the skin, I shall follow chiefly Willan and Bateman, though their arrangement is in some measure defective, as indeed every arrangement must be, until we become much better acquainted than we are with the nature and cause of these complaints. But no better system of classification has been proposed; and in regard to nomenclature, it is much better to retain the old, though not altogether acceptable, than to embarrass the learner, by new names, which after all might not be deemed worthy of adoption. Modifications of their plan will be introduced, when rendered necessary by the progress of discovery since they wrote.

The cutaneous diseases may be arranged in the classes of 1. rashes; 2. pimples; 3. vesicles, including bullæ; 4. pustules; 5. scales; 6. tubercules; 7. discolorations; and 8. parasitic affections. To these, in order to include certain diseases which do not belong to either of the above categories, it is convenient to add a division of unclassifiable complaints.

Rashes are characterized by a red, superficial efflorescence, diffused or in patches, disappearing under pressure, and commonly ending in desquamation. They are by some authors denominated *exanthemata;* but this term has also been applied to various other cutaneous eruptions, especially those attended with fever, and in the latter sense is employed in this work.

Pimples (papulæ) are small, somewhat conical elevations, pointed at the top, containing neither lymph nor pus, and ending usually in a scurf.

Vesicles (vesiculæ) are circumscribed elevations of the cuticle, containing lymph either limpid and colourless, or more or less opaque and whitish or pearl-coloured. When large, and consisting of a clear fluid separating the cuticle from the true skin, they are called *bullæ*, blebs, or small blisters.

Pustules (pustulæ) are circumscribed elevations of the cuticle, containing pus. Willan and Bateman make four varieties; viz. 1. *phlyzacium*, large on a hard circular base of a vivid red colour, and followed by a thick, hard, dark scab; 2. *psydracium*, small, often irregularly circumscribed, but slightly elevated, terminating in a laminated scab, often clustering and confluent, and, after the discharge of pus, pouring out a thin watery humour, which frequently forms an irregular incrustation; 3. *achor*, small, pointed, containing a straw-coloured matter of the appearance and nearly the consistence of strained honey, and succeeded by a thin, brown or yellowish scab; and 4. *favus*, containing a more viscid matter than achor, with a frequently irregular and slightly inflamed base, and ending in a yellow, semi-transparent, and sometimes cellular scab, like a honeycomb. But, in fact, the favus of Willan, as will be seen under the head of *porrigo*, is no pustule at all.

Scales (squamæ) are hard, thickened, whitish, opaque laminæ of cuticle.

Tubercules (tubercula) are small, hard, superficial, circumscribed, permanent tumours. They must not be confounded with the scrofulous or consumptive tubercles.*

Discolorations (maculæ) are changes in the colour of the skin, produced by modifications of the colouring matter, independently of any other affection.

Parasitic affections are those which depend essentially on the presence of microscopic animal or vegetable parasites.

It is important that the learner should bear in mind, that the nosological divisions of cutaneous diseases are more or less abstractions. They will not by any means always be found in nature of the same precise and definite character as stated in the books. Certain striking cases may correspond sufficiently with the definitions; but, in numerous instances, they run into one another, so as to render discrimination difficult or impossible. Thus, the rashes are often mingled with papulous, vesicular, or pustular elevations; these latter are not unfrequently conjoined in the same case; and, in some diseases, the regular progress of the eruption is through the different states successively of pimple, vesicle, and pustule.

Article I.

RASHES

To this division belong *Rubeola*, *Scarlatina*, *Erysipelas*, *Erythema*, *Roseola*, and *Urticaria*. By many writers, purpura is also included, but, for reasons before given, I consider that affection as belonging to diseases of the blood, and not to the cutaneous eruptions. Of the above-mentioned rashes, rubeola, scarlatina, and erysipelas belong to the idiopathic fevers. Only erythema, roseola, and urticaria are here considered.

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* To distinguish these two kinds of bodies, which have nothing in common but their condition as small tumours, I have adopted the spelling of *tubercule* for the cutaneous affection, retaining the old name for the scrofulous *tubercle*; so that the reader may understand at once the meaning of the two terms respectively when he meets with them, without the necessity of being, on each occasion, specially guarded against mistake. (*Note to the fourth edition.*)

pecially at the commencement, and not so much in continuous patches, and by a more frequent accompaniment of fever. Scarlet fever and measles have a somewhat similar eruption; but erythema wants the peculiar course and accompaniments of these affections, and is not like them contagious. Its rash, moreover, is not crescentic or in splotches like the rubeolous, nor punctated or widely and uniformly diffused as that of scarlet fever. When raised into wheals, erythema bears some resemblance to urticaria, from which, however, it is at once distinguished by the absence of the intense itching which characterizes the latter. The papulous form might be confounded with some varieties of lichen; but the smaller, rounder, firmer, and paler papulæ of the latter, with the itching and tingling that attend it, would sufficiently distinguish them. Care must be taken not to confound erythema with syphilitic eruptions. The greater duration of the latter, their coppery or grayish hue, and the general course of the disease of which they are a symptom will serve as criteria.

The *causes* of erythema are not always evident. It is generally connected with a disordered state of system. It is apt to occur during dentition, and is occasionally produced by irritating substances in the stomach. Fevers and bowel complaints are occasionally attended with it during their course, or in the convalescence; and it not unfrequently accompanies certain exanthematous fevers, such as small-pox, spreading over the skin in the intervals of the proper eruption. It is said also occasionally to have some connection with a deranged state of the menses. During the years 1828 and 1829, an epidemic (*acrodynia*) prevailed at Paris, of which an erythematous eruption, with a thickening and desquamation of the cuticle, was one of the most prominent symptoms. I have seen a striking case of erythema in a patient with metastatic abscesses. The disease is not confined to any age, and occurs in both sexes.

Treatment.—The treatment in local cases must be somewhat varied with the cause. If the erythema depend on acrid secretions, care must be taken to prevent as much as possible their contact with the skin, which should be protected by mild unctuous preparations, as the ointment of rose-water, spermaceti ointment, &c. If the inflammation be considerable, lead-water may be applied. In cases of intertrigo, perfect cleanliness, frequent washing with cold water, separating the surfaces by a soft linen rag or otherwise, dusting the parts with some mild absorbent powder, as starch, tutty, calamine, or prepared chalk, the application of Goulard's cerate, or weak solutions of acetate or subacetate of lead, sulphate of zinc, or acetate of zinc, and, if the inflammation is considerable, mucilaginous or emollient applications, or what is, perhaps, the most efficacious, a strong solution of nitrate of silver, are the appropriate remedies. If the erythema proceed from pressure, this must be obviated by mechanical contrivances, and the skin protected by the common lead-plaster. Washing with spirit, or with a solution of alum in brandy, often modifies the condition of the skin so as to prevent this unpleasant effect of pressure. In chronic cases, especially when there is excoriation, collodion may be usefully employed. It acts by excluding the air.

When the local affection is connected with a morbid state of the system, or of the internal organs, little treatment is required, except what may be necessary to correct the disease in which it originates. The antiphlogistic regimen, antacid or saline laxatives, and, when there is fever, the refrigerant diaphoretics, as the antimonials and neutral mixture, are all that is required. Sometimes, when the pulse is very strong, it may be proper to take a little blood; but this is seldom requisite. Dr. Begbie has found quinia successful in *E. nodosum.* If the local affection be hot and painful, demulcent lotions and the warm bath may be used. I have usually employed saturnine lotions in *E. nodosum* of the extremities. It is possible that leeches near the inflamed part might be useful in obstinate cases. When the sudden retrocession of the eruption has occasioned unpleasant or alarming symptoms, a sinapism, blister, or other active external irritant should be applied to the portion of the surface which it had occupied.

II. SCARLET RASH, or ROSEOLA.

This is defined to be a rose-coloured efflorescence, variously figured, without wheals or pimples, and not contagious.

Roseola appears sometimes as a distinct exanthematous fever; sometimes as a mere symptomatic eruption. In the former case, it commences with slight febrile symptoms, which are attended with more or less gastric derangement, continue one, two, or three days before the appearance of the rash, and subside along with it. The eruption commences usually upon the face, neck, and breast, with specks or small patches, which sometimes remain distinct, but more frequently coalesce in a greater or less degree; and occasionally the whole surface of the body, or large portions of it, are covered with an almost uniform redness. The patient frequently complains of itching and tingling in the affected parts. The fauces are often reddened, and the papillæ of the tongue appear through a slight coating of fur. Sometimes there is a feeling of roughness and even soreness of throat. The eruption is generally of short continuance, sometimes lasting only a day or two, sometimes running on to the fourth or even fifth day, before it entirely disappears. It fades gradually, and is commonly followed with little or no desquamation.

The efflorescence differs considerably in appearance. In some cases, it bears a close resemblance to that of scarlet fever in its punctuated character or general diffusion, and in its bright redness. In other cases, it is more like measles, with distinct, somewhat regular, slightly-elevated patches, of a darker hue. The patches vary in size from a mere speck to half an inch or even an inch in diameter. Occasionally they have the form of rings, with sound skin in the centre; but this is comparatively rare.

Sometimes the eruption disappears and returns, and, thus alternating, continues for a week or more before taking its final leave. When it recedes suddenly, symptoms of internal irritation occasionally appear, such as disordered stomach, headache, giddiness, faintness, pains in the limbs, and dejection of spirits, which are relieved by the recurrence of the rash. In some instances, these symptoms, and especially obstinate nausea and vomiting, precede for a time the appearance of the eruption, after which they subside immediately. The affection has been known to assume a chronic form; the efflorescence coming and going at uncertain intervals, or fading in the morning to revive towards night; but such instances are rare. The itching and tingling which generally attend the eruption are sometimes wanting. A roseolous efflorescence occasionally also occurs without fever. In no case is the affection contagious, and one attack does not secure against a second.

Dr. Willan, with an unnecessary nicety, has made seven distinct varieties of roseola, founded either on the season at which the disease is most apt to occur (*R. æstiva* and *R. autumnalis*), on the form of the eruption (*R. annulata*), on the age of the patient (*R. infantilis*), or on the disease of which it is an attendant (*R. variolosa*, *R. vaccini*, and *R. miliaris*).

The affection originates in a great diversity of causes. It often accompanies dentition. The vicissitudes of heat and cold in summer, the sudden checking of profuse sweat, the drinking of cold water during perspiration, are thought sometimes to cause it. It often results from gastric and intestinal irritation, and hence sometimes attends the bowel complaints of children, and dyspeptic affections in adults, and follows the introduction of irritating substances into the stomach. There is reason to think that it is occasionally provoked by gastric acidity. Copaiba sometimes produces a similar eruption, and I have seen it result apparently from the free use of dandelion. It is not uncommon in small-pox, whether natural or inoculated, and in varioloid, preceding the proper eruption in these complaints, sometimes covering almost the whole surface, and disappearing in two or three days. In the varioloid, it is supposed to prognosticate a favourable character in the chief disease. I have seen it occur in that complaint very profusely, and be followed by only a single pustule; and have reason to think that it has sometimes entirely replaced the original eruption. It has occasionally also been observed in the vaccine disease, appearing on the ninth or tenth day. Enteric or typhoid fever is sometimes attended with a roseolous efflorescence, which, in such cases, is apt to be mingled with miliary vesicles. I have witnessed a case in which these two eruptions occupied jointly almost the whole surface of the body; and both, in this case, came on after profuse sweating. The patient recovered, though attacked with pleurisy upon the disappearance of the rash. Roseola occasionally attends rheumatism and gout, and has been repeatedly observed in epidemic cholera, in the stage of reaction. In the latter case, however, the eruption sometimes presents the appearance of scarlatina, and sometimes imitates urticaria. It has been distinguished by the title of *roseola cholerica*. Scarlet rash has appeared in chronic pericarditis, but was probably an accidental complication. It sometimes occurs epidemically, and I have always noticed it most frequently during the prevalence of measles and scarlet fever.

Diagnosis.—Roseola sometimes closely resembles erythema; and there is reason to believe that the two affections often scarcely differ either as to their cause or nature. In decided cases, however, they may be readily distinguished by the signs mentioned under erythema. It is more important to distinguish the complaint from scarlet fever and measles, with which it is often confounded, and the more frequently from the circumstance that it is apt to prevail at the same time. It is probable that, in many of the cases in which scarlatina and rubeola are said to have occurred more than once in the same individual, roseola was mistaken for them. The two former complaints are contagious, the latter is not. The precautions which are sometimes highly necessary in the one case, are superfluous in the other. Roseola is a comparatively trifling disease, and seldom need occasion anxiety; scarlatina is not without great apprehension of danger, either primarily or secondarily, even in its mild forms. In decided cases of the three complaints, there can be little difficulty in the diagnosis. Scarlet fever is attended with sore-throat, measles with catarrh, and roseola generally with neither. The fever and disturbance of system in the latter is much less, as a general rule, than in the former, especially scarlatina. The eruption of roseola is usually brighter, and the patches, while they are more regular than in scarlatina, are less so than in measles, and seldom have the crescentic character sometimes observed in the last-mentioned complaint. Nevertheless, it is often impossible to discriminate between mild cases of scarlatina and roseola, especially when the latter is accompanied with sore-throat; and, if it should be accidentally associated with catarrh, there might be the same impossibility to distinguish it from measles. It is only after the doubtful complaint is over, that a correct inference may be drawn from a general survey of its cause, course, and effects.

Treatment.—This is very simple. The complaint will almost always terminate kindly without medical interference. In the severer cases, confinement to the house or chamber, a spare, cooling regimen, saline laxatives, magnesia if there is suspicion of acid in the stomach, antimonials or the neutral mixture if there is much fever, and the warm bath if the cutaneous irritation is considerable, are all that is requisite. Gentle friction with rye-meal may also be used to relieve the itching and tingling. Should the eruption recede, and unpleasant symptoms result, it should be recalled to the surface by external irritants or the hot bath. At the commencement of the attack, should the suspicion of scarlet fever be strong, an emetic of ipecacuanha may be given, and the bowels freely evacuated. At the worst, the treatment would be merely superfluous. In chronic cases, mineral acids and sea-bathing are said to have proved useful.

III. NETTLE-RASH, OR URTICARIA.

This is a non-contagious affection, characterized by the cutaneous elevations called wheals, which are usually surrounded by a diffused redness, and uniformly attended with itching, tingling, or other disagreeable sensation. Wheals are circumscribed swellings of the skin, of various shape and size, usually roundish or oblong, more or less hard, generally whiter, but sometimes redder than the healthy skin, containing no liquid, and having no tendency to suppuration. An example of them is offered in the small elevations which follow the application of nettles to the skin. Willan made six varieties of urticaria, of which three are recognized by Biett. There does not appear to be a necessity for any other division than into the acute and chronic.

The *acute* form of the disease (*U. febrilis* of Willan) generally commences with some fever, which precedes the eruption for two or three days, and is often complicated with signs of gastric and nervous disorder, such as headache, nausea and vomiting, pain in the epigastrium, anxiety, languor, faintness, and slight rigors. These symptoms commonly disappear upon the occurrence of the rash, which presents itself usually in the form of erythematous patches of a vivid redness, with wheals rising irregularly in the midst of them. Being attended with excessive itching, it causes the patient to rub or scratch the skin, and thereby very much to increase the eruption, which will often, under this kind of irritation, break out upon apparently sound portions of the surface. It may attack any part of the body, but is generally most abundant upon the inside of the forearms, and about the shoulders, loins, and thighs. It often also attacks the face, and is said sometimes to appear on the inside of the mouth. The eruption comes and goes irregularly, often declining in the day, and returning in the evening, with slight febrile exacerbation, and coming on with peculiar violence when the patient undresses and gets into bed. It has been said that the affection of the skin is aggravated by cold, and alleviated by warmth. The reaction produced in the surface after being cooled, no doubt often provokes the eruption; but I do not think that heat has any favourable influence upon it. The wheals last sometimes only a few minutes, at other times for several hours; and, on disappearing in one place, often return in another. In some instances they coalesce, giving rise to great tumefaction, tension and irregular hardness of the skin, and almost universal redness (*U. conferta* of Willan). The attack generally lasts a week or ten days, with frequent remissions and exacerbations of the cutaneous affection, and the occasional occurrence, during its course, of various disturbances of system, such as have been mentioned as preceding the eruption. These are sometimes distressing, and even alarming upon a complete retrocession of the rash, and disappear upon its return. At the close of the attack, a slight desquamation of the cuticle usually takes place.

In many instances, the eruption makes its appearance without previous fever. This happens especially when the disease proceeds from something taken into the stomach. In such cases, about an hour or two after the substance has been swallowed, epigastric pain or uneasiness, nausea, vertigo, anxiety, &c. come on, and are soon followed by the eruption, which is occasionally very violent. The face, neck, and chest, sometimes even the whole provoked by gastric acidity. Copaiba sometimes produces a similar eruption, and I have seen it result apparently from the free use of dandelion. It is not uncommon in small-pox, whether natural or inoculated, and in varioloid, preceding the proper eruption in these complaints, sometimes covering almost the whole surface, and disappearing in two or three days. In the varioloid, it is supposed to prognosticate a favourable character in the chief disease. I have seen it occur in that complaint very profusely, and be followed by only a single pustule; and have reason to think that it has sometimes entirely replaced the original eruption. It has occasionally also been observed in the vaccine disease, appearing on the ninth or tenth day. Enteric or typhoid fever is sometimes attended with a roseolous efflorescence, which, in such cases, is apt to be mingled with miliary vesicles. I have witnessed a case in which these two eruptions occupied jointly almost the whole surface of the body; and both, in this case, came on after profuse sweating. The patient recovered, though attacked with pleurisy upon the disappearance of the rash. Roseola occasionally attends rheumatism and gout, and has been repeatedly observed in epidemic cholera, in the stage of reaction. In the latter case, however, the eruption sometimes presents the appearance of scarlatina, and sometimes imitates urticaria. It has been distinguished by the title of *roseola cholerica*. Scarlet rash has appeared in chronic pericarditis, but was probably an accidental complication. It sometimes occurs epidemically, and I have always noticed it most frequently during the prevalence of measles and scarlet fever.

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The nettle-rash, though a very disagreeable and often troublesome complaint, is scarcely ever dangerous. Cases of death have been recorded, when the disease has arisen from substances swallowed; but it would be difficult to determine how far the result depended on the urticaria, and how far on gastric inflammation or other internal disorder produced by the same cause.

Causes.—The most frequent causes of urticaria are internal irritations, especially of the stomach and bowels. It often attends dentition, and the bowel complaints of children. Acid and other irritant matters in the stomach frequently occasion it. Certain kinds of food have been long notorious as the occasional cause of nettle-rash. Of these, shell-fish, as lobsters, crabs, shrimps, and especially muscles of different kinds, are most apt to produce it. Salt and smoked fish have been accused by some writers; and it has been supposed that some fish are more poisonous at certain seasons than at others, as, for example, at the time of spawning. Particular parts of fish have also been supposed to be more noxious than others; and Autenrieth concluded, from his researches, that the irritant principle is connected with the fatty matter. Other kinds of food, which have been enumerated as occasionally producing urticaria, are pork, mushrooms, honey, oatmeal, bitter and sweet almonds, raspberries, strawberries, and cucumbers. The worst case that I have seen occurred in a woman from eating raspberries. She had been twice before attacked in the same manner from the same cause. The face, neck, and extremities were greatly swollen, and the respiration in the highest degree embarrassed; but immediate relief was obtained by an emetic of ipecacuanha. Certain medicines occasionally produce it, among which are mentioned valerian, copaiba, and the turpentines. I have seen it result also from pipsissewa (*chimaphila umbellata*). This susceptibility to urticaria from particular kinds of food or medicine is not general, but an idiosyncrasy of individuals; and the food which will produce it in one person will often not produce it in another, each person being liable to be affected by some particular substance.

Over-exercise, strong mental excitement, indulgence in eating rich and high-seasoned food, and the intemperate use of stimulating drinks sometimes produce attacks of urticaria. It is said to be most prevalent in the spring and summer; yet some authors consider exposure to cold as a more frequent cause of it than heat. This can be readily understood, when it is recollected how much the face and hands of some persons swell and tingle during the reaction which follows exposure to cold.

Peculiar delicacy of skin predisposes to the disease; and some persons who have this character of surface are affected with it from the slightest causes. It is a not unfrequent attendant upon other diseases, especially fevers and febrile complaints; and I believe that it is one of the forms in which those protean diseases, gout and rheumatism, occasionally show themselves. It is said sometimes to have prevailed epidemically.

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surface of the body, are much swollen, with an almost universal erythematous redness, interrupted here and there by single or clustered wheals; and the patient, along with an intolerable heat, itching, and tingling of the skin, suffers occasionally from oppressed breathing, which almost threatens suffocation. This violence continues only for a few hours, after which the complaint gradually subsides, and terminates usually in one or two days. In some cases there is only redness of the skin, without the wheals. In the course of the affection, the patient often experiences severe pain in the stomach, nausea, anxiety, general distress, faintness, &c., alternating with or attending the eruption. The symptoms usually vanish very speedily after the stomach has been completely evacuated by means of an emetic or otherwise.

Occasionally acute urticaria assumes a decidedly intermittent character, occurring in regular paroxysms every day, or every other day, either as an attendant on intermittent fever, or as an original affection.

In the *chronic form*, there is no fever, and the eruption is not persistent, but appears and disappears irregularly (*U. evanida* of Willan); being sometimes absent for a considerable interval, and recurring from slight causes, as after violent exercise, or indulgence in the pleasures of the table. The wheals are usually whitish, and less apt than in the acute form to be surrounded by a red efflorescence, though attended with the tingling, itching, and stinging sensations characteristic of the disease. The patient often suffers more or less with the gastric and nervous symptoms before described. The duration of the complaint is very variable and uncertain, sometimes not exceeding a few days, and sometimes extending to months or years.

Occasionally the wheals increase rapidly, and attain a considerable magnitude, forming tumours in the loins, limbs, &c., sometimes as broad as the hand, and interfering with movement. These tumours are sometimes hot, tender, and painful, occur usually at night, and subside after continuing for a few hours, leaving behind them sensations as if the patient had been bruised or fatigued. This form of urticaria is the *U. tuberosa*.

In other cases, the wheals, instead of lasting only a few hours or a day, persist for two or three weeks after the redness has disappeared, and at length gradually subside. They constitute Willan's *U. perstans*.

It sometimes happens that the sensations bear no just relation to the amount of eruption; and Willan noticed a variety, which he called *U. subcutanea*, in which the patient suffers much from severe stinging pains as if needles were run into the skin, without any visible affection whatever, except an occasional eruption of wheals, which continue for two or three days, and then disappear without any relief to the morbid sensations.

In certain cases no eruption may be evident, but the morbid state of the skin is indicated by its appearance upon the application of anything irritant to the surface, even gentle friction, as by the clothing or with the hand. The susceptibility of the skin in these cases is such that, if a bluntly pointed instrument be passed with a slight force over the surface, an elevated red or white line follows, so that figures may be drawn, or names written on the skin. Dr. W. Gull, who describes this affection in *Guy's Hospital Reports* (A. D. 1[illegible], p. 316), distinguishes it by the name of *factitious urticaria*.

A case is described by Dr. Th. Renz, in which the eruption made its appearance exclusively on the tongue, producing considerable pain, and entirely destroying for a time the sense of taste. It followed the use of certain fruits, and its nature was evinced by a subsequent occurrence of the proper cutaneous eruption from the same cause. (*Würzburg. Med. Zeitschrift*, iii. 874.)

Diagnosis.—Urticaria is often mingled with other eruptive affections, such as erythema, roseola, lichen, and impetigo; and it is not always easy to determine which is the prominent disease. But, when distinct, there is little difficulty ts diagnosis. The peculiar sensations which attend it, and the appearance he wheals are, in general, sufficiently characteristic. Lichen urticatus, how- r, might without care be confounded with it, having both wheals, and the ning and tingling of nettle-rash. But the tumours in that complaint are aller, less prominent, of a deeper colour, firmer, and much more persistent; l are always attended with true papulæ, which cannot well be mistaken. *enave* and *Schedel.*) The tumours of erythema nodosum, though some- at similar to the large wheals sometimes seen in urticaria, are more durable, without the disagreeable itching.

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Every one is familiar with the rash produced by the application of nettles to the skin, from the resemblance of which to urticaria the latter derived its ordinary name. A somewhat similar affection, caused by the contact of certain caterpillars with the surface, is occasionally severe and troublesome.

Treatment.—Little medical treatment is required in most instances. The avoidance of stimulating and indigestible food and drinks, and of everything especially which may be known to have disagreed with the patient, conjoined with rest and mild aperients, will, in general, be quite sufficient. As excess of acid in the stomach is often the cause of the complaint, or at least serves to aggravate it, magnesia may be very properly employed as the laxative, either alone, or combined with one of the saline cathartics. Cold drinks should be given; but lemonade, as recommended by some writers, is of doubtful propriety. When the fever is considerable, the neutral mixture, or small doses of tartar emetic, may be used; and it is possible that the lancet may sometimes be requisite. In gouty or rheumatic individuals, wine of colchicum, in moderate doses, might be added to the other remedies. Should retrocession take place, with severe or alarming irritation, the disease should be invited again to the skin by stimulant applications and the hot bath. In cases of great nervous disturbance, advantage may accrue from camphor-water, Hoffmann's anodyne, or other nervous stimulant.

When the disease proceeds from any article of food, the stomach should be immediately evacuated by ipecacuanha, and the bowels afterwards by a dose of sulphate of magnesia or castor oil; and, in severe cases of uncertain origin, it would be proper to employ the same treatment, as the offending cause would very probably be found in the stomach, and the emetic would at any rate have the probable effect of moderating the cutaneous affection.

In chronic cases, which are sometimes very obstinate, Willan advises that the patient should abstain successively from the different kinds of food and drink which he had been in the habit of using, in the hope that the offending cause might thus be found and removed. In this way he frequently succeeded in tracing the disease to its source, which, in some was malt liquors, in others spirit, in others wine, in others, again, vinegar, or fruit, or sugar, or fish, or raw vegetables. (*Bateman's Synopsis*)

Dr. Geo. Budd speaks highly of the efficacy of rhubarb, given in the dose of three or four grains, immediately before dinner or before breakfast and dinner, in cases disposed to recur frequently, in consequence of the influence of several articles of food conjointly. The addition of from half a grain to a grain and a half of ipecacuanha to the rhubarb, increases its efficacy. (*Diseases of the Stomach*, Am. ed., p. 216.)

When the disease is very obstinate, and the habit of the patient plethoric, great advantage may be expected from the occasional loss of blood, and a rigid diet of bread and milk, so as to change the character of the circulating fluid. This treatment, however, should not be hastily adopted.

In intermittent cases, sulphate of quinia will quickly effect a cure. In full doses, continued for two or three days, it is said to have proved promptly effectual in some of the worst forms of the disease, even though not periodical.

Attention should, in chronic cases, always be paid to the general state of health. If the digestion is feeble, and the system debilitated, the simple bitters or sulphate of quinia may be used, associated, if there be acidity of stomach, with one of the alkaline carbonates. In other cases, the mineral acids have been found useful. Where other means fail, good may be hoped for from the arsenical solution. A most obstinate case of *Urticaria tuberosa*, which, for four years, had resisted various treatment, yielded, in the Hospital Saint-Louis, under M. Biett, to this remedy. (*Cazenave* and *Schedel.*) A gentle course of mercury might also be rationally employed in cases of unusual obstincy and continuance. It might be the means of removing some lurking internal inflammation, or of altering the character of the blood, and thereby removing the cause of the disease.

The local treatment should be very simple in acute cases. Rubbing the skin gently with rye-meal sometimes affords partial relief. Cold lotions, as of spirit and water, vinegar, lemon-juice, and lead-water, should be very cautiously used, for fear of sudden retrocession. A case is related by Frank, in which fatal metastasis to the brain took place, in consequence of cold applied to the surface. The warm bath, however, is safe, and may sometimes be advantageously employed. Repeated daily in chronic cases, it is considered one of the most effective remedies. Alkaline baths, however, prepared with carbonate of potassa or soda, are said to be still more useful; and vapour baths, or the vapour douche, have been highly recommended.

Article II.

PAPULOUS DISEASES.

Syn.—Pimples, or Papulæ.

THESE were at one time generally considered as papillæ, enlarged and somewhat indurated by inflammation. Erasmus Wilson believes them to consist in inflammation of the secretory orifices, whether sudoriferous or sebiferous. Plumbe thinks that they are the result of an exudation of coagulable lymph beneath the cuticle. Simon found them, under the microscope, to consist of slight elevations of the cutis, with the blood-vessels engorged with red corpuscles, and the tissue infiltrated with a colourless fluid, more consistent than serum. In other words, they are the result of inflammation of minute isolated portions of the cutis. Willan and most writers after him, describe three papulous diseases; viz., strophulus, lichen, and prurigo. Some unite strophulus and lichen, considering the former as a mere variety of the latter. There is, indeed, no great difference between them; but, as strophulus belongs exclusively to infancy, there is a convenience in treating of them distinctly. None of the papulous affections are contagious.

I. STROPHULUS.

This is commonly called *red gum* when the eruption is florid, *white gum* when it is pale or whitish. It occurs usually in infants, before or during the first dentition. The eruption is seated most frequently in the parts of the surface most exposed, as on the face, neck, arms, and hands; but it also frequently occupies other parts, and sometimes extends over the whole body.

In its most common and simple form, it appears in minute florid pimples irregularly dispersed, with occasional specs or patches of redness without elevation, and sometimes a few small vesicles, especially on the extremities, which usually dry up without breaking. This is the *S. intertinctus* of Willan, and is observed most commonly in infants under two months. Sometimes, along with these red papulæ, are mingled others of a whitish colour; and, when the irritation is slight, or the skin less than ordinarily vascular, the whole of the papulæ have this appearance. Willan distinguishes two varieties of them, one which he calls *S. albidus*, characterized by minute, hard, slightly elevated whitish specs, with a little redness at the base, the other *S. candidus*, having larger pimples, with a white shining surface, and no redness. In worse cases of the complaint (*S. confertus* of Willan), the eruption is more abundant, forming large irregular patches, and sometimes rendering the whole surface occupied by it of a uniform redness. Occasionally there are, in these cases, much itching and pain, with more or less excoriation, especially when the eruption is seated in the thighs or lower part of the body, so that the affection resembles intertrigo. In another variety (*S. volaticus* of Willan), the eruption occurs in small, circular, bright-red patches or clusters, which appear and disappear successively on different parts of the body, each patch turning brown, and beginning to exfoliate in about four days, and the whole continuing for three or four weeks.

Strophulus is, with few exceptions, an acute disease, generally beginning to exfoliate and disappear in one or two weeks, and seldom continuing longer than a month. It is rarely attended with fever, and often occurs without any observable disturbance of health. When febrile symptoms do take place, it is not always certain whether they are essentially associated with the eruption, or proceed from some other cause. Sometimes the papulæ, when numerous, appear to occasion much distress to the child by their heat and itching, and these sensations are increased when the surface is kept warm.

The affection probably often depends upon causes acting directly upon the very irritable and vascular skin of the infant. Too great exposure to heat, rough flannel next the skin, the accumulation of filth upon the surface, whether from without or from the infant's own secretions, are causes of this kind. It is sometimes associated with disorder of the stomach and bowels, and often occurs as one of the results of dentition. But, in many instances, it is not possible to trace the affection to any known cause.

Strophulus is almost always an innocent complaint. Its retrocession is thought sometimes to have been followed by serious internal irritations; but it is very difficult always to determine, in such cases, whether the disappearance of the eruption is cause or effect.

Treatment.—Very few remedies are required, and, unless the child appear to suffer, or the health to be otherwise disturbed, it would be better to do nothing, except to remove any obvious cause of the affection. The surface should be kept clean by frequent warm ablutions, the clothing should be of an unirritating character, and the infant should not be overheated. The diet also should be attended to; and, if the case is obstinate, it may be proper to change the nurse. When there seem to be much heat and itching of skin, relief may be given by the application of tepid milk and water, or mucilaginous liquids, and the occasional use of the warm bath. The stomach and bowels should be attended to, and acidity, if existing, corrected by magnesia, the alkaline carbonates, or prepared chalk; one or the other of these remedies being employed according to the state of the bowels. Attention should also be paid to the gums. Cold applications to the surface should be avoided, lest they might occasion a sudden translation to some interior organ. In the event of such translation, the warm bath, rubefacient lotions, and a few drops of aromatic spirit of ammonia internally, may be resorted to. In severe cases of strophulus, advantage is said to have accrued from an emetic.

II. LICHEN.

Willan defines this to be "an extensive eruption of papulæ, affecting adults, connected with internal disorder, usually terminating in scurf, recurrent, not contagious." But this definition is defective; for the complaint frequently affects children beyond the age of infancy, and is by no means invariably connected with internal disorder. Willan enumerates seven varieties; and this number might be doubled, if every diversity of form were a sufficient ground for a nosological distinction; but for all purposes of practical advantage, they may be included under the three following.

1. *Lichen simplex.*—This consists of small red pimples, about as large as the head of a pin, appearing usually on the hand, forearm, neck, face, and breast, but not unfrequently also elsewhere, and sometimes over almost the whole surface of the body. They are attended with heat, tingling, and itching, in various degrees. Upon the face they are often larger than elsewhere, and on the extremities are sometimes obscurely vesicular. Having continued stationary for several days, they begin to decline, and terminate usually with a slight scurf in one or two weeks. Sometimes, however, the attack is of much shorter duration; and sometimes, by the occurrence of successive crops of eruption, is prolonged for several weeks and even for months. In their course, the papulæ frequently exhibit small bloody scabs upon their surface, arising from its abrasion by scratching. In the more chronic forms of the complaint, they often scarcely differ from the skin in colour, but are always readily discovered by passing the fingers over the part affected. In these chronic cases, there is frequently much more desquamation, with some thickening of the skin; and the disease sometimes very much resembles psoriasis. When produced by the high temperature of summer, the complaint is commonly called *prickly heat*, the *L. tropicus* of nosologists, which, however, is identical with the variety above described. It occurs in this country very frequently among boys, affecting especially their arms, neck, and breast. In tropical latitudes it is much more severe, most frequently attacking strangers from temperate climates, but not sparing the natives. The sensations of tingling, itching, stinging, &c. are described as scarcely supportable, giving rise to an almost irresistible propensity to scratching and locomotion, which only aggravate the irritation; and the best means of counteracting it are patience, quietness, and keeping cool, both physically and mentally.

Sometimes the papulæ occur chiefly or exclusively at the roots of the hairs, constituting the *L. pilaris* of Willan. In persons of scorbutic habit, or hemorrhagic constitution, they are apt to have a purplish or livid hue, which has given rise to the designation of *L. lividus* by the same author.

Occasionally the papulæ have a disposition to assume a circular arrangement, forming patches which are called *ring-worms* in the language of the common people, and *L. circumscriptus* in that of the learned. These patches, at first small, gradually increase by the eruption of new pimples at the circumference, whilst those in the centre fade and exfoliate. In some cases, they disappear spontaneously in a week or two; in others, continue for several weeks, slowly enlarging, and often running together. Willan states that this form of lichen is sometimes produced in adults by vaccination. Biett has described another, which he names *L. gyratus*, in which the papulæ are arranged in the shape of a somewhat tortuous band of considerable length. In a case of this kind, alluded to by Cazenave and Schedel, the pimples, in small groups, formed a kind of riband, which, setting out from the anterior surface of the chest, gained the inner part of the arm, and descended to the extremity of the little finger, following the course of the cubital nerve.

Lichen simplex is sometimes preceded for a short time by febrile symptoms, which disappear when the eruption breaks out. Pains in the head or stomach, and other symptoms of internal disorder, also sometimes vanish under the same circumstances. But, in numerous instances, there is no constitutional disturbance whatever.

2. *Lichen agrius.*—This variety commences with fever, which subsides upon the occurrence of the eruption, though it does not always wholly disappear. The papulæ are small, very numerous, red, and inflamed, and clustered in large patches, which are surrounded, often to a considerable extent, by an erythematous redness. Occasionally small vesicles are intermingled with the pimples; but they soon disappear. The eruption is usually more limited

than in the milder forms of the disease, and is very seldom general. It occupies preferably the outer surface of the limbs, differing in this respect from eczema, to which, in the advanced stage, it sometimes bears a close resemblance. It occasionally also occurs in the cheek. The sensation of itching and tingling general in lichen, is in this variety combined with burning and smarting pain; which is aggravated by the heat of the bed, and by everything that has a tendency to excite or irritate the surface. The affection commonly remits in the morning, and undergoes exacerbation towards evening. After a few days, the tops of the pimples become slightly excoriated or ulcerated, and pour out a sero-purulent fluid, which concretes into small scabs. These are succeeded by minute scales, of a furfuraceous character, upon the separation of which the complaint may terminate, having run a course of two weeks or somewhat less. But often the surface remains more or less moist, or the scales fall and are replaced by others, or the eruptive affection vanishes for a time to return again; and thus successively for a period of several weeks, until at length the complaint exhausts itself, the sero-purulent discharge gradually diminishes, a dry furfuraceous surface succeeds, and the skin returns to a healthy state. In the moist state alluded to, the eruption resembles eczema or impetigo; and it is supposed by Willan, after repeated attacks, to terminate occasionally in the latter affection, though this is denied by others. During the progress of the complaint, the skin is often thickened, chapped or fissured, and very painful upon being rubbed or otherwise disturbed. L. agrius sometimes occurs originally in this form, and is sometimes a mere aggravation of the milder affection.

3. *Lichen urticatus.*—This variety is distinguished by the occurrence of small tumefactions, which are rather inflamed wheals than pimples, and resemble those produced by the bites of poisonous insects, or the sting of the nettle. These, however, subside in a day or two, and are followed by true papulæ; while other wheals appear, to be in their turn succeeded by papulæ; so that at length the whole surface may become covered with pimples, which are more or less confluent. Both the wheals and papulæ are accompanied with extreme itching. The affection is usually obstinate. Bateman says that it is peculiar to children, occurring sometimes soon after birth, and continuing many months. Others have observed it in adults. It occasionally follows vaccination, and is ascribed by parents to that operation; but the association is probably quite accidental. It sometimes disappears and again returns, and ultimately terminates in desquamation.

Causes.—One of the most frequent causes of lichen is heat. Hence, it commonly occurs in the warm seasons and in hot climates. Some persons are liable to a return of it every summer. It is brought on by exposure to the sun, by severe exercise, and by the use of stimulating drinks and condiments. The contact of certain stimulating powders with the skin may also induce it. Causes which disturb the general health, such as long watching, bad diet, and the abuse of alcoholic liquors, are thought sometimes to predispose to it; but it probably more frequently occurs in persons in robust health. Like many other cutaneous affections, it is occasionally associated with irritations of the alimentary canal, evinced by disordered digestion, nausea or vomiting, and diarrhœa. It is sometimes a sequela of acute fevers. It affects persons of all ages and of both sexes, but is most frequent in adults. In its milder forms, it would receive in suckling infants the name of strophulus.

The *diagnosis* of lichen is often very difficult; as there are numerous cutaneous affections to which, in some one of its forms or stages, it bears a more or less close resemblance. It has been mistaken for *measles* and *scarlatina;* but a moderate attention to the well-known characteristics of these several affections would leave no room for doubt. Sometimes it appears to be mingled with these exanthemata. Enough has already been said of its relation to *strophulus*. The distinctive characters of *prurigo*, to which it bears a close analogy, will be mentioned under that head. *L. urticatus* might be confounded by careless observers with *papulous erythema* and *urticaria*, the diagnosis of which has been given under the heads of these complaints respectively. The occasional resemblance of lichen to *eczema*, *impetigo*, and *psoriasis* has already been pointed out; and there are probably cases, which, in their nature and cause, are identical with the first two of these affections. From the intense itching which attends it, and the frequent appearance of little bloody scabs upon the tops of the papulæ in L. simplex, produced by scratching, it might be mistaken for the itch. In its ring-worm form, it might without care be confounded with *herpes circinatus*. For the diagnosis between lichen and these several complaints, the reader is referred to their respective titles in this work. Finally, this complaint, in the form of L. urticatus, bears some resemblance to certain syphilitic eruptions. The latter are distinguished by their copper colour, the absence of inflammation, their much less degree of itching, their greater permanence, and the circumstance that they are very frequently accompanied, or were preceded by other characteristic symptoms of syphilis.

Treatment.—Little general treatment is required in the ordinary acute forms of the disease. It is chiefly important to avoid the causes. The patient should remain as much at rest as possible, avoid exposure to the sun, dress rather lightly in hot weather, and live moderately as regards food and drink, shunning rich meats, stimulating condiments, and all kinds of alcoholic liquid. All substances which may have directly irritated the skin should be guarded against. If febrile symptoms attend the complaint, saline laxatives and refrigerant medicines may be given, though profuse diaphoresis is contraindicated. In all cases, the bowels should be kept regularly open. In Lichen agrius, it may sometimes be advisable to take blood once or twice from the arm, and to apply leeches in the vicinity of the inflamed part. A strict antiphlogistic diet should be enjoined in the early stages of this variety.

In the advanced stages of lichen, when the complaint has become chronic, and even at the commencement, if the system is feeble, as in *L. lividus*, it may be proper to give tonic medicines, as the mineral acids, sulphate of quinia or infusion of Peruvian bark, and the chalybeates; and the diet should now be nutritious. In very obstinate cases of long duration, some one of the arsenical preparations may be resorted to; and Fowler's solution, Pearson's solution, and the Asiatic pills have all been recommended. Devergie strongly recommends the tincture of cantharides, and has employed the alkaline remedies, both internally and externally, with much success.

The local treatment is quite as important as the general. In the early stages irritant applications should be avoided; nor should cold be too freely employed, from the fear of retrocession, and the production of internal disorder. Plumbe has observed an acute disease, with great heat and thirst, frequent pulse, vomiting, pain in the bowels, headache, and delirium, following imprudent exposure to cold in this complaint. The best local applications are demulcent washes, such as infusion of flaxseed, slippery elm, or sassafras pith, and emulsion of bitter almonds. The last-mentioned preparation is thought to be more effective in consequence of its hydrocyanic acid; and this acid itself, much diluted, has been recommended as a lotion. Lime-water, and solution of acetate of ammonia have also been found useful; and lotions of diluted vinegar sometimes yield relief. In the severer forms, the blandest oleaginous substance should be used, such as the ointment of rose-water, or pure and perfectly sweet almond oil. Glycerin is also a good application. Powdered starch may be employed. Wilson has derived benefit, in Lichen agrius, from the application of collodion; and still better, as it contracts less in drying, is a solution of gutta-percha or caoutchouc in chloroform. The warm bath is very useful; but care must be taken that it is not so hot as to be in any degree stimulating. M. Chausit strongly recommends a solution of aloes in glycerin, applied daily by means of a hair-pencil. He has found it peculiarly useful in the excoriations and fissures of the skin frequently attendant on Lichen agrius. He prepares it by evaporating from four to eight parts of tincture of aloes till the alcohol is all driven off, and then adding gradually thirty parts of glycerin. The first effect is usually a smarting sensation, which soon passes off. Five or six applications at most are sufficient to cause obstinate fissures to heal. (*Gaz. des Hôp.*, 1857, Nos. 50, 62.)

When the disease has become chronic, sulphurous or alkaline baths may be substituted with advantage for the simple warm bath. For the preparation of the alkaline bath, carbonate of potassa or carbonate of soda may be dissolved in water, in the proportion of an ounce to the gallon. These salts may also be used in the form of lotion or of ointment; two or three drachms to the pint of water being employed in the former shape, and from ten to fifteen grains to the ounce of lard in the latter. The sulphur vapour-bath has been recommended by Plumbe. When the eruption has reached the furfuraceous state, and continues obstinate like psoriasis, stimulating applications may be employed, as ointments of calomel or protiodide of mercury, of corrosive sublimate in the proportion of fifteen or twenty grains to an ounce of lard, citrine ointment, and especially tar ointment. Erasmus Wilson has found greatest benefit from a tincture of the seeds of Croton Tiglium, made in the proportion of an ounce of the seeds to four fluidounces of alcohol.

A papular eruption, attended with intolerable itching, and often intermingled with vesicles and pustules, and sometimes with erythematous patches or ulcerations, has been observed in Germany, as occurring in persons who pick gooseberries when ripe, or are exposed to the bushes. Jahn has found that this affection is owing to the attacks of minute insects of the genus *Leptus*. It is readily cured by washing the affected part with soap and water, or a solution of hepar sulphuris. (See *Am. Journ. of Med. Sci.*, N. S., xx. 191.)

III. PRURIGO.

This is an eruption of papulæ, having nearly the same colour as the healthy skin, and attended with excessive itching. It is closely analogous to lichen, and might, perhaps, without violence, be considered a modification of that disease. From the ordinary forms, however, of lichen it differs in the absence of redness, in the generally somewhat larger and less pointed pimples, though these are not unfrequently very small, and in the greater intensity of the itching. Lichen is, moreover, most commonly acute, and often attended with fever; prurigo, on the contrary, chronic and without fever. Neither of the complaints is contagious. Willan makes three varieties of prurigo; namely, *P. mitis*, *P. formicans*, and *P. senilis*. The first two differ only in degree; the last has some peculiarities which entitle it to distinct notice.

The eruption in prurigo is sometimes confined to one spot, sometimes attacks several distinct parts at the same time, and occasionally, though very seldom, affects the whole surface. Its favourite seats are the neck, shoulders, back, and outer surface of the limbs. It is rare in the face, unless in severe chronic cases, and almost always spares the feet and palms of the hands.

From their want of colour, the pimples are often not observed; the attention being chiefly directed to the small black scabs scattered here and there over the affected parts. These are produced by the concretion of the bloody exudation from the tops of the papulæ, abraded by the violent rubbing or scratching, to which the patient is irresistibly impelled. But the papulæ are readily distinguished by running the fingers over the surface. They are coionally mingled with temporary wheals, and small inflamed pustules, pro- ced by friction. In severe cases, along with the itching is a sense of formi- tion and painful pricking, as if insects were crawling over the surface and nging it, or as if the skin were pierced with hot needles. These sensa- ns are almost incessant, but are aggravated by heat, and by sudden expo- re to cold, as in undressing. They are often so distressing after the patient s become warm in bed, as to prevent sleep for several hours.

Under proper treatment, the disorder sometimes disappears in two or three eks, usually with a slight desquamation; but it is very apt to become chronic, sisting for months, and sometimes, with occasional remissions or suspensions, en for years. Dr. Willan says that, in its milder form, it is sometimes ulti- ately converted into contagious scabies, and, in its severer form, ends occa- onally in impetigo. Some cases are recorded by Dr. Wm. W. Green (*Boston ed. and Surg. Journ.*, Oct. 18, 1855, p. 239), which seem to show that there a form of prurigo which is itself contagious. This apparent contagiousness prurigo, and its apparent conversion into scabies, are readily explicable, hen it is understood that the irritation, caused by the itch-insect, sometimes ows itself in the form of pimples, instead of vesicles or pustules. The affec- on, in these cases, was undoubtedly scabies from the commencement.

In very old cases, of years' duration, the papulæ become much enlarged, rdened, and sometimes confluent; the skin is thickened and often inflamed; e characteristic eruption is mingled with vesicles, pustules, and even boils; brile symptoms and various internal disorder complicate the complaint; and e patient is reduced to a condition of indescribable wretchedness, too often yond the reach of remedies. The want of sleep, arising from the inces- nt itching, must have a tendency to impair the general health. Plumbe scribes the obstinacy of these cases to an organization of the enlarged papulæ, onsequent upon the long-continued inflammation.

In the *Prurigo senilis* of Willan, the eruption is of the same kind as in the rdinary forms, though perhaps rather flatter, and somewhat less abundant; ut the variety is chiefly characterized by its occurrence almost exclusively in he old, by the extreme severity and permanence of the itching, and by the ob- tinacy of the complaint, which often resists every variety of treatment. An- ther distinguishing feature is a tendency to generate pediculi, which are some- imes very numerous and troublesome. It occurs most frequently in the feeble, nd those exposed to the privations of extreme poverty.

Causes.—Prurigo occurs at all periods of life, and in both sexes; but is nost common in youth and old age. It is apt to make its attacks in the spring nd beginning of summer, though not confined to any season. Sometimes it ppears to be connected with gastric or intestinal disorder. It has been as- ribed to rich and stimulating food, to intemperate drinking, to the use of va- ious irritating or indigestible articles of diet, as salt meats, certain kinds of ish, pickles and vinegar, and finally to circumstances of poverty which tend to leteriorate the health, among which may be mentioned confined air, unwhole- ome food, and mental depression. Want of personal cleanliness, and of the proper change of clothing, is probably one of its most frequent causes. Its source, however, is not unfrequently altogether unknown. In relation to the diagnosis, nothing is necessary in addition to what has been said under lichen.

Treatment.—Internal remedies have little direct efficacy in this complaint. The first object should be to correct any existing disorder, whether of a particular organ or of the system. Hence, the state of the stomach, of the bowels, nd of the liver should receive attention, and the menstrual condition should ot be overlooked. If the patient is debilitated, he should be invigorated by onics and nutritious food. The diet should be regulated. Indigestible, irri- ating, and highly stimulating substances should be avoided. Bread and milk them, remedies should be addressed to the general system, calculated to allay the character of the nervous actions; such as narcotics, the chalybeates in large doses, sulphate of quinia, and, in short, all those means which are considered useful in neuralgia. Various local measures have also been recommended. The applications before mentioned as employed in protracted cases of *Prurigo senilis* may be used. Leeches, emollient poultices, demulcents, and narcotic lotions, ointments, or cataplasms, will sometimes afford relief. Scrupulous attention should be paid to cleanliness.

I have not deemed it necessary to describe the pruriginous affections under the distinct local names which writers have attached to them; such as *Prurigo pudicis, P. pudendi muliebris, P. pubis, P. præputii, &c.* It is sufficient to have given the general etiology and principles of treatment, which may readily be applied to any particular case.

Article III.

VESICULAR DISEASES.

I. HERPES.

Before the reform introduced by Willan into the nomenclature of cutaneous diseases, this term was applied vaguely to various very different affections. At present, writers in general follow that dermatologist in restricting it to a vesicular eruption, occurring in circumscribed patches, upon an inflamed base, which extends somewhat beyond their margin, leaving portions of sound skin between them. It may or may not be associated with constitutional disturbance. In the severer cases, the eruption is generally preceded or attended by more or less fever, but not so in those of a milder grade. There is almost always a greater or less degree of burning pain, itching, and tingling; and sometimes the local suffering is very considerable. The complaint usually runs its course in a period varying from one to three weeks, and is very rarely chronic. The lymph in the vesicles, at first perfectly limpid, gradually becomes milky and opaque, and at length concretes into scabs, which fall off, leaving a temporary redness of the skin. In some cases, a copious serous exudation takes place, the patches become superficially ulcerated, and even gangrene may ensue. But such cases are comparatively rare. In all its forms the disease is essentially mild, and never terminates unfavourably, unless accompanied with some vice of constitution, which would impart malignancy to the gentlest affection.

In its severer forms, herpes bears some resemblance to erysipelas, which is in like manner often attended with a copious vesicular eruption upon an inflamed surface; but the former disease may be readily diagnosticated by its distinct clusters, with skin of the natural colour intervening.

The causes of herpes are very obscure. Sudden exposure to cold in a state of perspiration from heat or over-exertion, the direct action of irritants, and strong mental emotion, have been enumerated among its occasional causes; but they probably operate only by calling a pre-existing disposition into action. It is said to have sometimes occurred epidemically. It is most frequent in the young, and in persons with a delicate skin.

The following are the varieties generally recognized. They differ chiefly in the mere position or form of the vesicular patches.

1. *Herpes zoster.—Zona.—Shingles.*—In this variety, the clusters are situated upon one side of the trunk, and are arranged in succession, so as to form an irregular band, with one extremity directed towards the spine, the

[illegible] towards the sternum or linea alba. This band often extends one-half round the body, sometimes in a direct course, sometimes obliquely, and, in the latter case, though beginning on the trunk, it occasionally terminates either upon the thigh, or the arm. In some instances, the clusters commence in the middle of this line, and extend at each extremity; sometimes they occur first at opposite points of the trunk, and approach each other in the middle. It is a singular fact, that in the great majority of cases they occupy the right side, and that they very rarely pass the median line of the body. It is, indeed, asserted by some writers that the eruption never transcends these limits; and that, when it has appeared to do so, it was Herpes phlyctænodes and not the shingles. But this is making the phenomena of a disease bend to a definition. There can be no doubt that the shingles sometimes extend more than half round the body, and cases have been observed in which they have extended quite round it. The popular notion that such cases are necessarily fatal, is without the least foundation. Sometimes the row of clusters occupies the neck, or the side of the head, instead of the trunk; but in this case, also, it observes the general law of stopping at the middle line.

Each cluster consists of numerous roundish vesicles, which are very minute at first, but when mature are generally of the size of pearls, and sometimes as large as a split pea or larger. They are often confluent, sometimes over a considerable surface. The red margin extends but a short distance beyond the vesicles. The clusters are irregular in shape and size, generally somewhat larger in the direction around the body, and varying from one to three inches in diameter. They do not in general all occur at once, but succeed each other, and one has sometimes begun to fade before another is completely formed. The limpid fluid of the vesicles becomes opaque in three or four days, when they gradually decline, and the scabs usually fall off about the twelfth or fourteenth day; but as the clusters appear successively in point of time, and each runs its own course, the whole duration may extend to three weeks or more. Sometimes, from the friction of the clothes, or other causes, the patches ulcerate and tedious sores result.

The eruption is usually preceded for two or three days by febrile symptoms, with anorexia, general uneasiness, lassitude, &c., which are sometimes relieved when the clusters appear, sometimes continue in a greater or less degree in consequence of the irritation of the local affection. The patient often suffers considerably from the burning and smarting pain of the eruption; and not unfrequently experiences severe shooting pains more deeply in the trunk.

In relation to the causes of shingles, little need be added to what has been said of those of herpes in general. The curious fact seems to have been demonstrated by Dr. E. Leudet, of Rouen, that irritation or inflammation of the peripheral nerves causes a vesicular eruption upon the surface immediately over their line of passage, and that thus zona may arise from causes calculated to disturb the condition of those nerves. Among causes of this kind, according to M. Leudet, is the operation of the vapours of burning charcoal, inhaled into the lungs. (*Arch. Gén.*, Mai, 1865, p. 521.) This fact may point to an explanation of the tendency of shingles to spread in certain directions, and to stop at the median line. It serves also to explain the deep-seated neuralgic pain occasionally attendant on the disease. The diagnosis of zona is seldom difficult.

2. *Herpes phlyctænodes.*—The clusters of this variety of herpes are irregular, and have no fixed position. They occur most frequently on the cheek, neck, arms, or breast, more rarely on the lower extremities. Sometimes commencing on the breast, they spread successively over the whole trunk. When the eruption is thus extensive, the vesicles are usually very small. When larger, as in shingles at maturity, the clusters are very few, not often exceeding two or three in number; and sometimes there is only one. The affection

runs a rather shorter course than shingles. Each cluster usually completes its series of changes in a week or ten days; and the whole duration of the attack seldom exceeds two weeks. In some very rare cases, the affection assumes a chronic character, and it has been known to run on for months. In such instances, the clusters are very few, or quite solitary. The general symptoms and local sensations do not materially differ from those of Herpes zoster, though on the whole somewhat more moderate.

3. *Herpes circinatus.—Ring-worm.*—The distinguishing character of this variety of herpes is the occurrence of the vesicles in circular patches. In the common form of it, the vesicles appear at the circumference, forming a ring with a portion of skin in the centre free from eruption. Hence the popular name of ring-worm, which it shares with other eruptive affections having a similar shape. The seat of it is usually in the upper portions of the body, as the face, neck, arms, and shoulders, and more rarely on the lower extremities. The vesicles are generally very small, sometimes so as to require a close examination, in order to be detected. They rise upon an erythematous ground, though the surface is perhaps less vividly red than in the other varieties mentioned. The vesicles usually break in three or four days, forming minute scabs or scales, which give the ring a furfuraceous appearance. These fall off in about a week. But, as the clusters appear successively, the complaint often has a course of two or three weeks. It is seldom attended with fever or other constitutional disorder; and the local sensations, amounting generally only to a moderate tingling and itching, are less severe than in H. zoster and H. phlyctænodes. This variety of ring-worm occurs most frequently in children; and sometimes under circumstances which have encouraged the notion of its contagious nature, several members of the same family being affected at the same time. But this is owing not to contagion, but to similarity of exposure.*

Care is sometimes required to distinguish this affection from *Trichosis furfuracea* (*Porrigo scutulata* of Willan), and *Lichen circumscriptus*, which have a similar form, and are also called ring-worm in popular language. *Trichosis furfuracea* is a cryptogamous affection, and will be more particularly described hereafter. Some dermatologists consider the affection denominated technically Herpes circinatus as essentially cryptogamous, and to be in fact identical with Trichosis furfuracea, differing only in the circumstance, that the parasite is situated in the epidermis instead of the hair follicles. But these writers confound the proper herpetic ring-worm, which disappears spontaneously after a short duration, and is in no degree contagious, with the variety of ring-worm belonging to the cryptogamous diseases, which attacks other parts of the surface besides the scalp, is contagious, and, though readily yielding to remedies which destroy the parasite, has little tendency to spontaneous cure. *Lichen circumscriptus* is papulous, and has no vesicles. In the herpetic ring-worm, though the vesicles are often very minute, either they or their remnants may be detected upon close examination. Besides, the borders are more inflamed than in lichen, and the central portion, which in the latter is usually filled with pimples in the earlier stages, exhibits in the former either a sound state of the skin, or a slight redness, and only becomes somewhat furfuraceous when the affection is declining.

Occasionally this variety of herpes takes on a much more aggravated char-

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* *Epizoötic Herpes.*—An affection similar to this variety of herpes is said not to be uncommon among the cattle in Ireland. It occurs especially in calves, most commonly on the face and neck, and appears in the form of circular spreading patches, from which the hair falls, and which gradually dry up, leaving a scaly incrustation thickest at the borders. The affection is believed to be contagious, and is said to be imparted by contact to the human subject. It appears to yield to the same local measures found useful in ordinary herpetic ring-worm. (Dr. Wm. Frazer, *Dub. Quarterly Journ.*, May, 1865, p. 294.)—*Note to the sixth edition.*

ter. The patch, instead of disappearing as the first ring of vesicles declines,
enlarged by a new crop at the circumference, and this, in its turn, is fol-
wed by another, and thus the circle goes on widening, until it embraces a
ge extent of surface. In some cases, the vesiculated surface ulcerates, even
a considerable depth, and the complaint exhibits a succession of belts in
s state, an outer one forming as fast as the inner heals. This would fall
der the title of *Herpes exedens*, which has been given to the affection when
assumes an ulcerative character, with a disposition to advance. It is some-
mes very obstinate.

The cases described by Bateman as consisting of circles filled with crowded
icles, surrounded by an inflamed border, occurring successively upon various
rtions of the body, and attended with much burning pain, and more or less
ver, would seem to belong properly to *H. phlyctænodes*, from which they
fer merely in the regularity of the circumference of the patches.

Another form of herpes, first noticed by Bateman, and denominated by him
erpes Iris, exhibits circular patches, consisting of concentric rings of differ-
t shades of colour; an arrangement from which it derived its name. It oc-
rs usually upon the hands or arms, and sometimes on the instep. The erup-
on first appears as an efflorescence, which soon becomes distinctly vesicular,
e central vesicle being yellowish-white, the ring immediately around it brown-
h-red, the second ring nearly of the same colour as the centre, the third nar-
wer and dark-red, and the fourth of a light-red hue, forming a kind of are-
a, which gradually fades into the colour of the skin. The patches are small
first, and increase till they are three-quarters of an inch or more in diam-
er. They arrive at their height in a week or nine days, are stationary for
out two days, and occupy a week or more in their decline. They are at-
ded with no constitutional disorder. The affection is slight, and very rare.
may, without violence, be placed with H. circinatus.

4. *Herpes labialis.*—This is distinguished merely by its locality, occurring,
its name implies, about the lips, of which it occupies a greater or less por-
on, being sometimes confined to a part of one lip, or to an angle of the
outh, sometimes extending from one angle to the other along the upper or
wer lip, and sometimes surrounding the whole mouth, by a succession of
ustered vesicles. There is first a burning sensation, with redness, which is
on followed by vesicles; and the lip becomes hard, swollen, and often very
ainful. The lymph of the vesicles gradually becomes opaque, sometimes puru-
nt scabs begin to form in three or four days, and the disorder disappears en-
rely in ten or twelve days, or a shorter time. Sometimes the eruption occurs
an original affection with febrile symptoms, and occasionally soreness in the
uces, which, upon examination, exhibit vesicles similar to those upon the lips.
ore frequently, however, it is an attendant upon other complaints, such as
tarrhal, intermittent, remittent, and typhoid fevers, and the different phleg-
asiæ, in which its occurrence may be considered as a favourable sign, as it
enerally marks the commencement of convalescence.

5. *Herpes præputialis.*—The peculiarity of this, like the last-mentioned
riety, consists merely in its position, which is upon the prepuce, either upon
s outer or inner surface. The clusters are very small, consisting each of five
r six minute vesicles, which, if undisturbed, run the ordinary course, and get
ell in ten or twelve days. When on the inner surface, from the delicacy of
he epithelium, they are apt to break, and end in superficial ulcers, which, from
he irritation of the secretions of the part, the motions of the prepuce, or im-
roper applications made under the impression of their syphilitic origin, become
ometimes obstinate sores. This affection is distinguished from syphilis by its
esicular origin, occurrence in clusters, the superficial character of the ulcera-
ion, and the absence of the abrupt, hard edges, and adhesive yellowish-white
xudation on the surface, which characterize chancre.

Treatment.—As herpes almost uniformly runs a favourable course, unless interrupted by disturbing causes, all that is, in general, requisite in the treatment is to guard against the operation of such causes, and to relieve the symptoms when severe and painful. In reference to the first indication, stimulating food and drink should be avoided; the patient should remain at rest when the eruption is considerable, and especially when attended with constitutional symptoms; and care should be taken to prevent irritation of the inflamed surface by the friction of the clothes, or by stimulating applications. When the eruption is seated in the face, the patient should avoid exposure of the part to the sun, or to a hot fire.

If the complaint should be attended with febrile symptoms, cooling acidulous drinks, a strictly antiphlogistic diet, saline laxatives, and refrigerant diaphoretics may be directed. When the pain is severe, opiates may be added; and the best preparation is probably Dover's powder. Should the local affection show a tendency to gangrene, from a scorbutic state of system, or general debility, as sometimes happens in old people, the strength must be supported by tonics, moderately stimulating drinks, and nutritious food.

The local treatment is, in general, not less simple. When the inflammation is considerable, and the sensations of the part distressing, recourse may be had to cooling or demulcent lotions, as flaxseed tea, infusion of slippery elm, and weak solution of acetate or subacetate of lead; and, if the eruption is extensive, relief will be obtained by the occasional use of the warm bath. It has been proposed to destroy the vesicles by nitrate of silver; but this is unnecessary in a complaint so favourably disposed, and of so short a duration. In mild cases, it will be sufficient merely to protect the affected surface, when upon the trunk or extremities, by soft and fine linen. Should the surface be moist or ulcerated, it should be dressed with simple cerate, or spermaceti cerate, to prevent the adhesion of the clothes. When the ulcer appears indisposed to heal, Goulard's cerate may be applied, at first somewhat diluted with simple ointment, and afterwards, if necessary, undiluted. Collodion, and solutions of gutta-percha or caoutchouc in chloroform, have also been usefully employed, with the view of protecting the surface from the air. Cazenave recommends the application of a powder composed of one part of oxide of zinc and fifteen of starch. Should the case become chronic, and especially if the ulceration seem disposed to advance, it may be necessary to make use of mild caustic remedies, such as nitrate of silver or sulphate of copper. In the shingles, advantage is said to have accrued from the application of small blisters over the spots where the eruption threatens to appear, and, when there is much pain, from sprinkling morphia on the denuded surface. The propriety of this measure is obvious, if the disease, as has been suggested, depend on a pre-existing subcutaneous neuritis.

In *H. circinatus*, no internal remedies are, as a general rule, required. The tingling and itching may be relieved by very weak solutions of sulphate of zinc, sulphate of iron, sulphate of copper, alum, or elixir of vitriol; and these applications appear to shorten the duration of the complaint. Ink is often popularly employed for the same purpose, and the frequent application of saliva is recommended by some writers. Alkaline lotions are also recommended. Tincture of iodine will often remove it by one or two applications. In the ulcerative and spreading variety, the caustic treatment above advised may be cautiously tried, and especially the use of nitrate of silver.

H. labialis requires only the cooling or slightly astringent lotions above mentioned. Relief may here often be obtained by anointing the lips frequently with fresh cream cooled by ice, or with glycerin.

H. præputialis may be treated by the same astringent lotions, care being taken that they are not made too strong; but generally it will be sufficient to rd the part against irritation from the clothing, or the frequent motion of e prepuce. When the eruption is seated on the inner surface, it will be oper to introduce some dry lint to prevent the contact of the opposite sur- es, and to absorb irritant secretions. Should the irritation be considerable, may be proper to inject demulcent liquids carefully beneath the prepuce, d to employ emollient applications without.

The various irritant substances recommended by different authors in her- tic eruptions have reference to other and more obstinate affections, which re formerly confounded under the title of herpes.

II. ECZEMA.

This name was given by Willan to a non-contagious eruption, consisting minute vesicles crowded together in irregular patches, with or without sur- nding redness. It may be most conveniently considered under the two ditions of acute and chronic eczema.

Acute Eczema.—In its mildest form (*Eczema simplex*), this appears in tches of very minute, closely crowded vesicles, glistening and transparent, th little or no intervening redness, without fever, and with no other local sations than a disagreeable itching and tingling. In a short time, the rum in the vesicles becomes turbid or lactescent, and is either absorbed, or udes and forms a minute scale, which soon separates, leaving the skin per- ctly sound. The whole course of the eruption occupies from one to three eeks; but, as the crop of vesicles is sometimes renewed, the affection may ntinue much longer.

In a severer form (*Eczema rubrum*), the eruption is generally preceded d always accompanied by inflammation and redness of the skin. The vesi- les show themselves at first like glistening points, which can scarcely be seen contain a liquid, unless by the aid of the microscope. These enlarge, and hen fully developed have about the size of a pin's head. In the mildest cases, e vesicles dry up in about a week, and are succeeded by desquamation, after hich the surface remains of a reddish colour for a few days, and then resumes s healthy appearance. In the severer cases, the preceding and attendant in- mmation is of a higher grade, with much heat, some swelling, and a vivid dness. Instead of drying up, many of the vesicles break, and a serous fluid udes, often very copiously, which irritates and excoriates the skin, and thus creases the exuding surface. After a time, the secretion diminishes, and the xtravasated liquid concretes into thin soft scales, which, upon separating, are llowed by others several times successively; the surface of the skin after ch separation being still red and inflamed. If a favourable termination is take place, the exudation gradually ceases, the scales become firmer and ore adherent, and upon separating leave the skin less inflamed; and, at the xpiration of two or three weeks, the diseased surface resumes its healthy ppearance. But frequently new crops of vesicles show themselves, either upon e part previously affected, or upon the surrounding healthy skin, so as to xtend, in some instances very greatly, the limits of the disease. When, by e successive eruption of new vesicles, the affection is kept up for two or three onths, it may be considered as having assumed the chronic form.

In other cases (*Eczema impetiginoides*), the eruption, though at first vesi- ular, assumes afterwards a pustular form, similar to that of impetigo. The iquid in the vesicles becomes opaque, yellowish, and apparently puriform; nd, upon concreting, gives rise to soft yellowish scabs. These soon separate, aving inflamed surfaces, that exude a reddish liquid, and again cover them- elves with scabs or scales, to go through the same process as those which receded them. Gradually, however, the surface becomes less inflamed, the scales thinner and dryer, and the skin returns to its healthy state in the course of two or three weeks, unless the disease degenerate into the chronic form. It should be noted that, in *E. impetiginoides*, though most of the eruption may have this apparently pustular form, yet generally some of the true eczematous vesicles may be seen, either at the margin of the patches, or within them.

In either of the above varieties, the affection may be confined to a single surface of variable extent, or may spread, in successive patches, more or less extensively over the body. Sometimes it happens that, when the affection becomes general, some of the patches may be renewing and extending themselves by successive crops of vesicles, while others are healing. When the disease is extensive, it is very apt to give rise to fever. In all its forms, it is attended with disagreeable sensations, such as itching, tingling, burning, &c.; which, in severe cases, are almost intolerable.

In young and healthy persons, with a fair and delicate skin, though the eruption may rise more quickly to its height, it yet declines more rapidly, and leaves at last no observable traces behind it. But in the old, and those with dark, dry, and harsh skins, the inflammation is apt to extend to the subcutaneous tissue; the denuded surface becomes fissured; the healing process is slow and interrupted; and, when the disease has disappeared, it leaves behind a brown or brownish colour of the affected part, which continues for years, and often for life. (*Biett.*)

A variety of eczema, described by Hebra and Anderson (*Med. T. and Gaz.,* May, 1863, p. 474), consists of patches of redness at first resembling erythema, but, as the disease advances, attended with infiltration of the skin and the formation of scales, and still later with a serous exudation, concreting into crusts, but without at any time the occurrence of a vesicle. That these patches are truly eczematous is proved by their occasional appearance in connection with the characteristic vesicular clusters, and running a similar course.

Chronic Eczema.—This results from repeated and successive crops of the vesicular eruption, appearing before the effects of those preceding them have ceased. The vesicles soon break, and the serous exudation maintains a constant inflammation. The skin becomes excoriated and fissured; covers itself with scales or scabs, which fall and are replaced by others; and, when the disease spreads extensively over the body, presents a great diversity of appearances at the same time in different parts of the surface. Thus, in one spot are the forming vesicles; in another, the excoriated and perhaps bleeding surface; in a third, scabs or scales in various stages of development or decline; in a fourth, loose cuticle, as if separated by a blister; and, almost everywhere, except in portions of the skin which remain sound, marks of more or less inflammation, with redness, swelling, and tenderness. The quantity of liquid poured out from the ruptured vesicles and excoriated surfaces is sometimes very great, saturating the clothes of the patient, and not unfrequently causing them to adhere in places, so as to tear the skin, and occasion bleeding when they are separated. The tenderness of the inflamed skin is sometimes such as to render the pressure of the body very painful in lying. If the excoriated surfaces be examined, they will exhibit numerous small pores, from which liquid constantly oozes. When the loose cuticle or concrete scales are removed, the surface sometimes appears covered with a whitish cheesy exudation. While in the moist state, the skin exhales a peculiar, stale, disagreeable odour. The sensations of the patient are often in the highest degree tormenting. It is not severe pain of which he complains, but excessive burning and itching, which render it impossible for him to refrain from violently scratching and almost tearing the skin with his nails; and the sensation of pain, with the loss of blood thus produced, affords temporary relief. At length the inflammatory susceptibility of the skin appears to be exhausted the vesicles cease to be renewed, or are much diminished; the liquid exudation gradually dries up; and there is left behind a tendency to the constant and successive production of scales upon the diseased surfaces, which, at first soft, yellowish, and thickish, become gradually dryer, thinner, and whiter, and at last assume the form of the exfoliations in psoriasis, or even the furfuraceous appearance of pityriasis. Finally, these scales become fewer and fewer and produced no longer; the surface of the skin beneath them loses its red colour, and returns slowly to its natural state; and the patient recovers his health after many months, perhaps years of suffering.

Parts affected.—Dermatologists are not agreed as to the precise seat of the disease. Rayer and others place it essentially in the cutaneous follicles; Biett in the superficial layer of the skin, the office of which is to secrete the epidermis. In some cases it is no doubt in both.

The eruption may appear upon any portion of the surface; but there are certain parts which it especially affects. The parts covered with hairs, as the scalp, pubes, &c., are very apt to be attacked by it. It occurs also not unfrequently in the flexures of the joints. It may be confined to one single patch, or may consist of distinct clusters, scattered more or less extensively, sometimes in one region of the body, and sometimes, though more rarely, over the whole surface.

In the *scalp*, it may be partial or general. In the latter case, it is apt to spread to the nape of the neck, the ears, and the face. In the earlier stages, the hair is matted together by the copious exudation. In the more advanced stages, scales or scabs are formed; and the singular phenomenon is presented, of a large number of hairs penetrating one scab, which has concreted around their base, and is raised with them as they grow above the level of the skin. The disease is often complicated with bleeding wounds from the nails of the patient, small subcutaneous abscesses, swelling of the glands of the neck, scabs from intermingled impetiginous pustules, and innumerable pediculi. In time, the ichorous discharge ceases, and the affection becomes scaly or furfuraceous; and, before recovery, the hair is sometimes permanently lost from portions of the scalp. The complaint has frequently been mistaken for impetigo and porrigo or favus, from which it is distinguishable by the vesicular character of the eruption. It often occurs in infants and children during dentition; and is thought by some to be rather favourable to health, by giving an external direction to the irritations incident to that period of life. Children have been noticed to be in good general health during the continuance of the eruption, and to suffer upon its removal.

From the head it sometimes spreads to the *face*, where it undergoes similar changes, and constitutes a variety of the affection denominated *crusta lactea*. It may originate also in this position. When in the face, it is apt to pass to the conjunctiva, producing ophthalmia, and into the nostrils and mouth, causing inflammation in the lining membrane, and a copious serous secretion. It sometimes destroys the eyebrows and eyelashes. The *ears*, when attacked by it, swell very much externally and within the meatus, which sometimes becomes the seat of small abscesses, and a very obstinate purulent discharge.

In middle-aged men, the disease is disposed to attack the inner and upper part of the thighs, the genitals, and arms, where it keeps up an irritation and excessive itching, which is inconceivably harassing. Women also suffer much from the disease in the same situations, and in them it occasionally attacks the inner surface of the labia, producing effects which, without careful examination, may be mistaken for leucorrhœa or gonorrhœa. The excessive itching, however, would lead to the suspicion of eczema, and the discovery of some vesicles upon inspection would determine the nature of the affection.

In the flexures of the joints, as in the axilla, the groin, the bend of the elbow

ery troublesome, producing in the end a thickened
s or fissures, and a scaly condition of the surface,
treatment.

ly upon the arm, forearm, and hand, and between the
mistaken for the itch. Sometimes, though rarely, it
se it is somewhat modified by the thickness of the cu-
he escape of the serum.

are generally such as act through the constitution; for,
ants will sometimes excite the disease, it requires a peculiar
give the irritation this particular form. Among the causes
he system are, in children, the unhealthy milk of nurses, and
aults, derangements of menstruation, pregnancy, the parturient
the change of life in women, and intemperance in both sexes.
d epidemic influence are also among the causes. The mercurial
said occasionally to produce it; and a variety of the disease has
s name (*Eczema mercuriale*) from this supposed origin. I have
ing my whole professional life, in the habit of prescribing mercury,
rivate and hospital practice, and do not recollect to have seen a case
ng from that cause. There can, however, be no doubt that it has often
d during a mercurial course; and the circumstance, that it has disap-
upon the cessation of the mercurial action, would seem to prove that
sumed may be, in some instances at least, the real cause.

ong the local excitant causes are the direct rays of the sun, long expo-
e of any portion of the surface to artificial heat, blisters and rubefacients,
d various irritants to which the hands of certain artisans are peculiarly exposed, as cooks, bakers, sugar-refiners, dyers, and workers in metals. A distinction, however, must be made between this disease and the vesicular eruption produced by certain irritant substances, as occasionally by Burgundy pitch, croton oil, &c., which subsides as soon as the irritant is withdrawn, and never runs through the protracted course of eczema, in its more obstinate forms. Willan gave the name of *E. solare* to the eruption produced by exposure to the sun upon the face, hands, &c. It may be doubted how far this property belongs to the disease under consideration. As often seen, the vesication from exposure to the sun is only a slight affection, which yields immediately upon the removal of the cause, and the application of demulcents. It is possible, however, that the heat of the sun, like other irritants, may call a predisposition into action, and thus give rise to the genuine disease. There is no reason to think that eczema is contagious. Instances are mentioned in which it appears to have been communicated by contact; but they are few; and the secretion in these cases probably acted on an existing predisposition, like any other irritant. The time of life appears to have no effect as a predisposing cause; for all ages are liable to the disease; but it has some influence in fixing the seat of the affection. Infants and young children are peculiarly liable to have it in the scalp and face; adults in early or middle life, upon the arms, the trunk, or about the genitals; and old persons, upon the lower extremities.

Women are more frequently affected than men, perhaps in consequence of the disturbing influence of their peculiar sexual functions. The disease is more apt to appear in spring and summer, than in autumn or winter.

Diagnosis.—In its three different stages, eczema is liable to be confounded with three different kinds of eruption; namely, with the vesicular affections, such as herpes, the miliary eruption, and scabies, in its early or proper vesicular stage; with lichen agrius and impetigo, in its stage of excoriation and puruloid secretion; and with pityriasis or psoriasis, in its last, or scaly stage. But in herpes, the vesicles are larger and more hemispherical, the patches are surrounded by a broader margin of redness, and there is not the same dispodition to the copious effusion of serum. The miliary eruption, though widely diffused, is isolated, and not in patches, and is besides attended with much more violent constitutional derangement. For scabies the complaint is particularly liable to be mistaken when between the fingers, or in the flexures of the joints; but the diagnosis will be better given when that complaint is treated of. From lichen agrius it may be distinguished by the existence of some vesicles on the borders, or even within the limits of the patch, while in lichen, any eruption which may be observed is papular. Eczema, even when most like impetigo, differs from it in the vesicular character of the eruption as it first appears, in the continued occurrence of some vesicles even in the advanced stage, and in its thinner and firmer scales. The same occasional appearance of vesicles, even in the most advanced stage, will sufficiently distinguish it from the proper scaly diseases, especially if opportunity has been afforded of ascertaining its early vesicular character, and its successive changes before attaining the scaly form.

Prognosis.—In its lighter forms, eczema is a trivial affection, getting well in a week or two, without other inconvenience than a disagreeable itching. Even the severer forms of it, though distressing while they last, often terminate favourably in two or three weeks. In its chronic state, it is sometimes very obstinate, continuing occasionally for years, and proving a source of inexpressible discomfort; but it is without danger, is often attended, even in its worst condition, with surprisingly little disorder of the constitution, and almost always ends in recovery. During dentition, it may sometimes be looked upon as a safeguard to the system, and caution is necessary in the employment of repellent measures. When accompanied, in the female, with deranged menstruation, it will often refuse to yield during the continuance of that disorder. When attendant upon pregnancy, it is said seldom to disappear until after delivery. There may be some risk in curing very old cases of the disease; and an instance of insanity is recorded which resulted from such a cure. The inference is, that, when attempts are made to subvert a very old eczema, its place should be supplied by a seton or issue.

Treatment.—I shall first speak of the general, and afterwards of the local treatment. In mild acute cases, no other general remedies are required than gentle purgation with the saline cathartics; the use of small doses of the antimonials and neutral mixture, with refrigerant drinks, when the pulse is somewhat excited; a light and easily digestible diet; and a careful avoidance of all known exciting or predisposing causes. Sometimes a purgative dose of calomel may be advantageously given to children. In the severer cases, with considerable general excitement, or much local inflammation, it may be proper to take blood from the arm, to employ the antimonials and refrigerant cathartics more freely, and to restrict the diet to vegetable food. Acetate of potassa, in the dose of thirty grains three times a day, has been employed with the happiest effects, producing cures in many cases in one or two months. (Easton, *Ed. Month. Journ. of Med. Sci.*, May, 1850, p. 422.) To procure rest, it is necessary sometimes to have recourse to opiates, or some other narcotic, as the extract of hyoscyamus or conium, with which it will be proper, if there be fever, to combine ipecacuanha or tartar emetic.

In the chronic form of the disease, various remedies have been recommended. One indication is obvious; that, namely, of correcting any apparent derangement of function, whether of the liver, digestive organs, kidneys, or uterus. Afterwards, or in connection with this treatment, recourse may be had to special remedies. The mineral acids, the carbonates of potassa and soda, and the decoction of dulcamara, have severally had their advocates. In the very old cases, recourse must be had to more powerful alteratives. Tincture of cantharides is said to have proved very efficient, given at first in moderate doses, and gradually increased as the patient could bear it. Biett places great reliance, in such cases, upon the use of the preparations of arsenic. The solution of arsenite of potassa may be used; but he prefers the arseniate of soda or that of ammonia, which he gives in the dose of $\frac{1}{24}$ of a grain dissolved in water, and gradually increased to the $\frac{1}{16}$ or $\frac{1}{8}$ of a grain. In old cases, however, in which it is necessary to persevere long with the remedy, even for years in some instances, the smaller dose should be adhered to. The influence of mercury is sometimes found useful; but the mildest preparations should be employed, and profuse salivation avoided. A very slight effect, maintained for a long time, is indicated. Nevertheless, corrosive sublimate is preferred by some experienced practitioners; and, in connection with tartar emetic, it has been found effectual in some obstinate cases. Of course, both should be used in very small doses, so as to avoid offending the stomach. Iodine may also be tried with some hope of benefit; and recourse may be had to Donovan's solution, as combining the three last-mentioned powerful remedies in one. Solution of chloride of calcium has been recommended in scrofulous cases. In the advanced stages, my own experience has been decidedly in favour of Fowler's solution, with decoction of dulcamara. From three to five drops of the solution, and two to four fluidounces of the decoction should be given three times daily, and continued if necessary for several months, with occasional intermission, if either of them should be found to affect the system too strongly. When the patient is anemic, the preparations of iron should be employed, and when scrofulous or defectively nourished, cod-liver oil; and the two remedies may often be very properly associated.

The *local treatment* is important. In the acute cases, mucilaginous liquids and emollient cataplasms are indicated; to which, when there is considerable inflammation, a solution of acetate of lead may be added. Care should be taken to avoid everything irritant in these applications. Hence, all the ingredients should be quite free from mustiness or rancidity. Perhaps the best mucilage is that of slippery elm, and the best poultice that made of bread and milk. Glycerin is also an excellent, and at the same time convenient application. Should the inflammation be severe, leeches may be applied in the neighbourhood. When the disease is extensive, warm and mucilaginous baths should be substituted for the more limited emollient, and the patient should continue in them for an hour at a time.

To relieve the itching and tingling, recourse may be had to anodyne and soothing applications, such as emulsion of bitter almonds, decoction of dulcamara or of poppy heads, and infusion of opium, or solution of the salts of morphia; care being taken that this latter application be not so strong as materially to affect the system.

Cauterization by nitrate of silver or other escharotic has been employed in the early stage, but with variable results; and, on the whole, this class of remedies is not deemed advisable. Nevertheless, I have seen a case of the complaint yield quickly to tincture of iodine applied to the diseased surface.

In the chronic affection, while the fresh crops of vesicles continue to appear, recourse should continue to be had to the measures above mentioned. In the state of excoriation, the cerate of subacetate of lead may be applied with hope of benefit. The effect of excluding the air by the application of solutions of gutta-percha or caoutchouc in chloroform may be tried. Ointments of oxide of zinc and of magnesia have sometimes effected cures. The same oxide may be used also in the form of powder, mixed with fifteen parts of starch. Erasmus Wilson employs benzinated ointment of oxide of zinc, which he rubs with alcohol in the proportion of a drachm to an ounce, and applies to every part of the surface, so as to give it a complete coating. This must be kept entire, if necessary, by repeated applications; care being taken that it be not so thick as to prevent the escape of any fluid that may be effused beneath it.* (*Braithwaite's Retrospect*, xxxiv. 200.) The lime liniment of the pharmacopœias has been recommended. In the more advanced stages, when the affection has become scaly, the hot bath, vapour bath, or hot douche may be substituted for the warm bath. Solutions of the alkaline carbonates, in the proportion of from one to three drachms to a pint of water, are thought to have proved useful locally; and some depend on them as the chief remedy. They may be applied by means of linen compresses. Similar solutions may be used in the form of a bath, which may contain from four to eight ounces of the carbonate of potassa or of soda. Sulphur-baths are said to have sometimes proved beneficial. Certain stimulant ointments are often highly useful. Among them, the ointments of calomel, iodide of mercury, nitrate of mercury, and iodide of sulphur have, perhaps, the highest reputation. They should be employed first in a diluted state, and their strength gradually increased as circumstances seem to require. Tar ointment is sometimes very efficient. I have seen the disease, after a duration of several months, yield immediately to this application. It must be recollected, however, that it is adapted exclusively to the scaly stage. The oil of cade has recently been recommended in Europe. It acts no doubt like tar, being prepared in a similar manner. The same may be said of the empyreumatic oil of birch, used for the same purpose in the north of Europe. Cod-liver oil is said to be very effectual in the cure of eczema in the advanced stage, if thoroughly applied. Some prefer the oil in the form of soap, which may be made by incorporating with it about one-tenth of carbonate of potassa or of soda. Where the surface is covered with crusts, these should be removed by poultices, previously to the application of the alterative remedy.

III. MILIARY ERUPTION.

Syn.—*Miliaria.*—*Sudamina.*

This name is given to minute vesicles, not exceeding a millet-seed in size, which are scattered in great numbers over different parts of the body, usually as an attendant upon certain febrile diseases.

Symptoms, Course, &c.—At first the vesicles are so small as scarcely to be visible unless upon close inspection; and attention is often called to them, in consequence of a feeling of roughness, which they impart to the fingers when the skin is touched. If the surface is now viewed obliquely, it may be seen to be thickly studded with little glistening vesicles, almost as transparent as water, and looking very much like minute, almost microscopic drops of clear sweat upon the skin. They gradually enlarge, become hemispherical, and assume a pearly aspect, in consequence of the liquid within them becoming somewhat opaque and milky. Sometimes they are formed on a red base, and consequently have a reddish tinge (*Miliaria rubra*); sometimes rest upon the skin in a perfectly natural state as regards colour, and are either transparent or whitish (*Miliaria alba*). They are usually quite distinct and irregularly scattered over the surface, though occasionally crowded together in spots so as to present a clustered appearance, and, in some instances, coalescing into the form of bullæ of considerable size. They may be dispersed over all parts of the body, but are most abundant upon the neck and trunk, and are rarely found in the face. In some instances, they are attended with itching or tingling; in others, occasion no peculiar sensation. Each vesicle soon dries up, seldom lasting longer than from two to five days, though successive crops of them are often produced. They are followed by a slight, and often scarcely perceptible desquamation.

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* This ointment is made according to the officinal directions for ointment of oxide of zinc; benzinated lard, prepared by rubbing powdered benzoin with melted lard, in the proportion of ten grains to the ounce, being substituted for pure lard.

A distinction has been made between *sudamina* and miliary vesicles; the latter name being given to the eruption when formed upon a red base, attended with itching, of a conical shape, and ultimately becoming opaque and pustular; the former, to the vesicles when of a semi-globular form, and not preceded or attended with redness or itching. The distinction, however, will not hold; for the two often appear together, and one form may run into the other. Nor does there seem to be a good reason for confining the title of sudamina to the vesicles when they occur as a mere epiphenomenon of diseases, and for calling those only miliary which are supposed to be characteristic accompaniments of one peculiar disease, denominated miliary fever. They are probably the same under whatever circumstances they occur; and it is at least doubtful whether they can, with propriety, be considered as characteristic of any disease.

Cause.—Miliary vesicles or sudamina almost always occur in connection with febrile complaints, which, however, they do not appear in any degree to affect, as regards either their course or result. Nor are they restricted to any grade or form of fever, but may occur equally in the mild and malignant, the inflammatory and the typhous. Thus, we meet with them in the typhus and typhoid or enteric fevers, in scarlatina, as a precursor of the eruption of small-pox, in the milk fever of puerperal women, in phthisis, in rheumatism, and in many of the phlegmasiæ. The only known condition that favours their production is copious and continued sweating. In whatever febrile disease that phenomenon is presented, we may look for sudamina, though they will by no means be invariably found. Nor is this condition absolutely necessary. We often meet with them in enteric fever and typhus, when there has been no sensible perspiration. They are said sometimes to appear in health, after severe exercise in warm weather, which has provoked copious sweating.

It would appear that epidemic influence occasionally gives a tendency to sudamina in different diseases; for there are occasions when they are more than usually prevalent, and, without any obvious cause, are met with as an attendant upon complaints, in connection with which they are on other occasions seldom seen. There is not the least reason to suppose that they are contagious. They are said to occur more frequently in summer than winter.

Diagnosis.—The only other eruption with which the miliary can be confounded is eczema; and there is generally little difficulty in distinguishing them. Eczema is more disposed to appear in patches, is attended with much more itching and irritation, is of much longer duration, and is not apt to occur as an attendant on severe fevers.

Prognosis.—The miliary eruption is itself quite insignificant. It is sometimes, however, useful as a sign in diagnosis, especially in enteric and typhus fevers. The idea has been entertained that its sudden retrocession is accompanied with danger. We can readily understand that the sudden supervention of a severe internal phlegmasia may cause the retrocession of the eruption; but in such a case its disappearance is an effect and not a cause.

Treatment.—The miliary eruption demands no special treatment. It may, indeed, without injury, be quite overlooked in the management of the several diseases which it accompanies. The copious sweating which favours its production, if it be not the cause of it, may be usefully treated in some instances by refrigerant remedies, in others by quinia or the mineral acids.

Miliary Fever.—Sweating Miliaria.—Sudor Miliaris.—Miliaris Sudatoria.

Though not disposed to admit the existence of a peculiar disease, of which the miliary eruption is a characteristic, as the variolous pustules are of small-pox; yet I do not doubt that a peculiar epidemic fever has sometimes preailed in different parts of Europe, to which the names above given have been plied, and which is often attended with the eruption alluded to. Indeed, I ave seen something like it in this country. But the sudamina are admitted ot to be essential to the affection, and, in fact, are often wanting; and they e probably more frequent in this than most other fevers, chiefly if not exclusively because the disease is attended with copious sweats. It may be proper give a brief sketch of the disease. The following account of it is condensed hiefly from Rayer.

It occurs in diversified forms, which may all be included in the two, of mild nd malignant. The milder variety commences abruptly, or after the shorter r longer continuance of various precursory symptoms, such as lassitude, pains ear the eyes, anorexia, epigastric pains, and feelings of general heat. The eriod of attack is marked by the occurrence of sweating, or rather of hot apour steaming from the skin, at first from one portion of the body, but ery soon from the whole surface. There is at the same time extreme weakness, with a tendency to syncope, a singular constriction of the chest, and a oft, frequent, intermitting pulse. (*Cazenave* and *Schedel.*) The tongue is urred, the appetite feeble or quite wanting, the respiration oppressed, and he bowels costive. After these symptoms have continued two, three, or four ays, with sweating all the time, the eruption makes its appearance, and preads with different degrees of rapidity over the body, presenting the characters which have been already described. Rayer states that the sweating s a more constant symptom than the eruption. It is very copious, and has n odour like that of rotten straw. The disease gradually declines, and ends n complete recovery by the eighth, ninth, or tenth day.

The malignant variety is characterized by the occurrence of violent inflammation in some of the interior organs, especially the stomach, lungs, kidneys, nd brain, and appears to owe its danger to these complications. It sometimes proves fatal in two or three days, but more frequently ends in about a eek, and sometimes runs on for two or three weeks.

No other cause for the disease is known than epidemic influence. Rayer hinks it contagious, but offers no convincing proof. He states, indeed, that t cannot be conveyed by inoculation with the liquid from the vesicles.

The mild variety is not dangerous, and always ends in recovery under an xpectant treatment. The malignant forms are sometimes extremely fatal. The treatment of the disease must be conducted upon the principles applicable o fevers in general.

IV. PEMPHIGUS.

Syn.—*Pompholyx.* (Willan.)

PEMPHIGUS belongs to that section of cutaneous diseases which consist in he eruption of bullæ, blebs, or small blisters. In this particular affection, the ullæ are usually large, contain a yellowish transparent fluid, and terminate in he formation of thin scabs. The disease is acute or chronic.

Acute Pemphigus.—In its mildest form, this occurs without fever, and with ittle or no inflammation. Bullæ, from the size of a pea to that of a chestnut, ppear in succession upon the face, neck, or limbs, and, having continued for hree or four days, break, and soon afterwards heal. This is the *Pompholyx enignus* of Willan, and is a trivial affection. It occurs most frequently in children, and appears to be connected with dentition or disordered digestion.

A much severer form of the disease, attended with fever and inflammation, s described by writers on dermatology, and, though not admitted by Willan nd Bateman, and certainly rare, has too much testimony in its favour to be ejected. It usually commences with more or less constitutional disturbance f a febrile character, which continues from one to three days, before the appearance of the eruption. This shows itself in circular spots of inflammation, at first bright-red, but afterwards becoming dusky, and varying from a few lines to two inches or more in diameter. Upon each of these a blister speedily forms, either covering the whole inflamed surface, or occupying a portion in the middle, leaving a circle of redness around it. Some of the red spots never form blisters, though the cuticle may be readily detached. The bullæ vary from the size of a pea to that of a hen's egg. The skin between them is perfectly sound. They quickly attain their full size, and are then transparent and yellowish. In the course of one, two, or at most three days, they begin to decline, and most of them break; the serum contained in them having previously become somewhat turbid, and occasionally reddish. They are followed by thin yellowish-brown scabs, which soon separate, leaving surfaces of a dusky-red colour. Should the cuticle be removed before becoming dry, excoriations are produced, which are sometimes painful, but usually heal without much difficulty. The whole course of each bulla is completed in about a week; but, in consequence of successive eruptions, the disease may be prolonged to three weeks.

The bullæ may appear on one part of the body exclusively, or may extend more or less thickly over the whole surface.

During their continuance, the constitutional disorder is often so slight that the patient is not confined to bed; but, in some instances, there is much fever, with delirium and other alarming symptoms.

The *Pompholyx solitarius* of Willan may be attached to this variety of the disease. It is characterized by the appearance, after some tingling of the skin, of one large blister, which rapidly increases so as to contain several ounces of liquid, and, breaking within forty-eight hours, leaves an excoriated surface. Another bulla rises, in a day or two, in the same vicinity, and, pursuing the same course, is in its turn sometimes followed by two or three others, so as to make the whole duration of the eruption eight or ten days.

Chronic Pemphigus.—*Pompholyx diutinus* (Willan).—This is distinguished from the acute only by its longer continuance, and the absence of the early febrile symptoms, which characterize the most prominent form of the preceding variety. The eruption is usually preceded for a considerable time by signs of constitutional disorder, and smarting or pricking sensations are felt in the part before the bullæ appear. These run the same course individually as the acute, but, as they decline, others appear; and the disease is thus maintained for months, and sometimes for years. Not unfrequently the bullæ may be seen in all stages upon different parts of the surface at the same time. They may be confined within a space of three or four inches, may occupy a distinct part of the body, as a leg, an arm, or the face, or may spread over the whole surface. In the last case, the body may be at times almost covered with crusts; but this is rare. Painful excoriations are sometimes produced, which disturb the rest, and, when much multiplied, may occasion a slight febrile paroxysm at night. This form of the disease is often associated with a general depravation of health, which gives rise to various internal inflammations, and in the end not unfrequently to dropsy.*

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* A curious vesicular affection, closely resembling pemphigus, has been described by Dr. Geo. Burrows, who has seen two cases of it; both apparently caused, in butchers, by poison received through wounds, while skinning or otherwise preparing a sheep's head. In one instance, the first symptom came on about a month after exposure to the supposed cause. The affection begins with an eruption of vesicles and bullæ, from the minutest size to that of split peas, appearing first upon the face, but soon on other parts of the body, and affecting also the lips, the conjunctiva, and the mucous membrane of the mouth. The eruption has an inflamed base, and the bullæ frequently acquire a considerable size, and sometimes run together, forming large blistered surfaces. They prefer the most delicate parts of the surface, where the cuticle is thinnest, as the cheek, the lips, beneath the chin, the inner side of the thighs, the scrotum, &c. At the same time a mucous discharge takes place from the mouth and nostrils, and a puruloid discharge

Causes.—These are obscure. The acute variety, which is confined chiefly to children, has been ascribed to dentition, errors of diet, exposure to the sun, &c. The chronic disease attacks chiefly the old, and men more frequently than women. It probably depends generally upon an impaired state of the constitution from disease, bad living, intemperance, excessive fatigue, exposure, &c.

Diagnosis.—There can be little difficulty in distinguishing pemphigus when in the state of bullæ. The only affection with which it could be confounded is *rupia*. When in the scabby state, it bears some resemblance to certain forms of impetigo. For the diagnostic signs, the reader is referred to these diseases.

Prognosis.—So far as regards the mere eruptive affection, the prognosis is almost always favourable. The febrile symptoms which attend the acute variety in infants are said sometimes to be serious. In the chronic disease, it is the vitiated state of health that has given rise to the pemphigus, and not that disease itself from which fatal results are to be apprehended.

Treatment.—The acute disease requires in general nothing but a cooling regimen, and saline laxatives. In its severer forms, when the pulse is strong, and the constitution vigorous, it may be proper to take some blood from the arm, and to apply leeches in the vicinity of the severest inflammation. The warm bath also is useful. Care should be taken to avoid rubbing off the cuticle from the blistered surfaces; and, when excoriations occur, they should be protected from the air by dressings of simple cerate.

In the chronic form, the treatment must be addressed to the state of the constitution. If this is vigorous, and especially if the disease is associated with internal inflammation, the antiphlogistic plan should be pursued; consisting of a low diet, saline purgatives, refrigerant drinks, the warm bath, and sometimes general or local bleeding. Alkaline baths also are recommended. In the opposite condition of health, tonics are indicated; and recourse may be had to the mineral acids, chalybeates, simple bitters, quinia, and a generous diet. Attention should be paid to the digestive organs. Opiates or other narcotics are often requisite, to procure sleep and relieve the distressing sensations of the local disease. For the same reason, soothing applications should be made to the excoriations; and, when these are indisposed to heal, the cerate of subacetate of lead may be employed. Rest is necessary, to avoid injury to the blistered surfaces. In very obstinate cases, recourse should be had to the internal use of arsenic.

V. RUPIA.

Rupia is characterized by flattish, distinct bullæ, containing a serous, purulent, or dark sanious fluid, and followed by thick scabs, easily separated and soon renewed, or by ulcers. There seems to be some doubt whether this may not be the same disease as ecthyma; as the two are often together, and the pustules of the latter affection sometimes appear in the form of mere purulent bullæ, or blisters containing pus.

In its mildest form (*Rupia simplex*, Bateman), the disease first breaks out in bullæ, without preceding inflammation. These are about an inch in diam-

from the eyes. The eruption comes out in successive crops. It is attended with more or less burning pain. The bullæ are perfectly clear for two or three days, then become opaque, shrivel, and leave sores or scabs, which upon healing are followed by red spots. They continue to appear for almost three weeks. Fever attends the eruption, and, when the bullæ are numerous, is considerable. Dr. Burrows applied starch powder to the bullæ and a lotion of honey and borax with warm water to the mouth and throat; gave Dover's powder at night; and supported the system with port wine, infusion of bark, and rich nutritious food, at the same time giving fifteen grains of chlorate of potassa every four hours. One of the cases recovered, under this treatment, in four or five weeks; the other, which came under care later in the disease, proved fatal. (*Med. Times and Gaz.*, June, 1856, p. 589.)—*Note to the fifth edition.*

eter, and contain a fluid, which is at first thin and transparent, but soon thickens, becomes purulent, and dries into brownish rugged scabs, thicker in the centre than at the borders. The scabs are easily detached, and leave ulcerated surfaces, which either cicatrize, or form new scabs successively several times, until the morbid tendency is exhausted, and the surface heals. A livid redness is usually left behind for a longer or shorter time.

In a severer form (*Rupia prominens*, Bateman), there is usually at first an inflamed surface, on which the bulla forms with greater or less rapidity. The liquid it contains is apt to become opaque and blackish. Sometimes the blisters disappear without scabbing; but generally scabs form very rapidly, according to Bateman, in one night These subsequently receive additions beneath, and at their circumference, by the vesication and scabbing of successive borders of the surface around them, until they attain their full size, which is generally larger than that of the milder kind. From their mode of formation, the scabs have a conical shape, and exhibit circular marks of the several additions made to them, giving them the appearance of certain small oyster shells. Sometimes the scabs adhere for a considerable time, sometimes separate, leaving ulcerated surfaces, which are either covered with new scabs, or remain as unhealthy and occasionally deep circular ulcers. These, however, at length heal, leaving purple stains upon the skin, which last for a long time.

Still more severe is the *Rupia escharotica* of Bateman, which consists of bullæ formed upon a livid surface, small at first, but gradually and irregularly enlarging, with a blackish opaque liquid, and ending in ulcers. These spread and deepen, are surrounded by an inflamed border, and covered with a fetid, excoriating pus or sanies Many of them appear successively. They are attended with pain, restlessness, want of sleep, and fever; and either heal at last, after a very protracted duration, or end in death in the course of a week or two. Sometimes eschars form, which leave deep pits in the skin after recovery.

The different forms of rupia appear preferably on the lower extremities or about the loins and nates; but they also break out in other parts of the body. They occur generally in persons debilitated by old age, intemperance, bad living, and the various privations of poverty, or by previous disease, especially small-pox and scarlatina. They may occur at all periods of life. The R. *escharotica* is apt to appear in new-born children, or during the period of the first dentition, and is especially disposed to attack those badly fed and badly clothed, and with health depraved by various causes.

Diagnosis.—Pemphigus and ecthyma are the only complaints from which there can be any difficulty in distinguishing the bullæ of rupia. From pemphigus they differ in the circumstances, that their contents are generally opaque and sanious; that the scab is often conical, thick and fluted, and surrounded by a vesicated border; and that they leave behind them ulcers which are often deep, foul, and difficult to heal. The diagnosis between this complaint and ecthyma belongs to the latter disease. (See *Ecthyma.*)

Prognosis.—It is only the R. escharotica which is dangerous. The others are sometimes tedious and troublesome, but they get well sooner or later; and, if death takes place in the course of them, it is not from the skin affection, but from the general state of health which gave rise to it.

Treatment.—It is highly necessary to attend to the state of the constitution, and endeavour to correct the general health. The digestive organs, and the state of the blood especially require attention. A diet of light, nutritious, and easily digested food, both animal and vegetable, is generally indicated; as are also frequently the tonics, as quinia, the mineral acids, malt liquors, wine, &c. The alterative influence of mercury, with sarsaparilla, may be tried in obstinate cases. I have found iodide of potassium to act like a charm in curing, or apparently curing, the disease.

lation to external remedies, warm baths or alkaline baths may be em-
and emollient applications may be made to the inflamed eruption. In
e of ulcers, it sometimes becomes necessary to apply something capable
ging the action of the diseased surface. For this purpose nitrate of
a, perhaps, the best remedy, being applied in the form of the solid stick,
r less strongly according to the severity of the local disease. Other
nts or escharotics may be used; as sulphate of copper, nitric and mu-
cids, and the ointments of red oxide of mercury, nitrate of mercury,
or biniodide of mercury, &c. It is probable that iodide of potassium
prove useful in the form of cerate.

gangrenous variety must be treated by tonics and stimulants to sup-
e strength, and the warm bath or emollients externally, until the severe
tional symptoms disappear; after which the same course may be pur-
in the other varieties.

Article IV.

PUSTULAR DISEASES.

I. ECTHYMA.

name of ecthyma was appropriated by Willan to an eruption of phly-
ous pustules, generally distinct, non-contagious, and without fever.

affection may occur either in an acute or a chronic form. This appears
he only essential distinction. In the former, the eruption appears, runs
rse, and disappears, without return. In the latter, the disease is kept
constantly renewed crops of pustules.

ptoms.—In the acute variety, the eruption is often preceded by symp-
constitutional disturbance, such as lassitude, pains in the limbs, epi-
uneasiness, loss of appetite, and irregularity of bowels, which continue
eater or less degree until the pustules have run their course. These
ke their appearance as distinct, conical elevations of the size of a split
smaller, of a bright-red colour, and often very painful. They occur
equently on the neck and shoulders, and sometimes on the extremities,
dom if ever upon the face or scalp. They enlarge, and spread at the
ad, in the course of three or four days, or sooner, exhibit pus at their
, and present an appearance not unlike that of small boils. The little
es break after a while, and, discharging their pus, form brown, closely
nt scabs, which fall off in a week or two from the commencement of the
e, and leave dark-red surfaces of six or eight lines in diameter, with
ally a slight superficial scar in the centre. (*Rayer*.) These stains
lly disappear. Sometimes two of the pustules join, and thus acquire
size, and an irregular form. The inflammation is occasionally suffi-
produce a painful sympathetic swelling in the neighbouring lymphatic
. Young persons are peculiarly subject to this form of ecthyma. It
E. *vulgare* of Bateman's Synopsis.

he *chronic* form, some vice of constitution sustains the morbid tenden-
the skin, and crop after crop of the pustules arise, protracting the dis-
ion for several months. Not unfrequently, too, the local affection is
aggravated character; the pustules being more numerous, more exten-
diffused, and severally larger, more depraved, and more obstinate.
ces, instead of pus at the summit of a conical elevation, with a border
mmation, the whole reddened surface throws out a purulent fluid,
g a sort of bulla, not unlike that of rupia after its contents have be-
rbid. In some instances, a portion of the pustules undergo a sort of

resolution; the pus being absorbed, and its place supplied by a mere scale, instead of a scab as in ordinary cases. This happens most frequently upon the hands and feet. Now and then the scabs, when separated either by accident or spontaneously, leave ulcers, which may be deep, unhealthy, painful, and very slow in healing. This is said to be especially the case in those instances of the disease which follow small-pox and scarlet fever.

In persons of vitiated health, the old, the intemperate, and those worn out by various privations and fatigue, the pustules have a dark-red or purplish base, are unusually large, and spread over almost the whole body, except the face. In eight or ten days they break, and discharge a sanious or bloody matter, which leaves a deep excavation. This fills up with a dark scab, which appears as if firmly set in the skin, and is surrounded by a swollen, hard, and dark-red border. In this state the affection remains for many weeks, or for months, unless the scab is forcibly removed, when an ill-conditioned and obstinate ulcer is formed, exuding an offensive sanies. This is the *Ecthyma luridum* of the Synopsis.

In other cases, occurring also in depraved constitutions, the eruption attends a febrile condition of the system, with various disorder of the functions, and presents an appearance closely resembling certain forms of cutaneous syphilis. Though most abundant in the lower extremities, it may occupy any portion of the surface, even the face and scalp, which are usually spared by the disease in its other forms.

In consequence of the appearance of a new set of pustules before the old have completed their course, the surface often has a very diversified aspect, exhibiting the affection at the same time in all its stages of inflamed elevation, matured pustule, scab, ulceration, and lurid or purple stain.

From what has been said, it will be inferred that ecthyma may be confined to one part of the surface, or may extend over the whole. It appears to have a predilection for the lower extremities, though it not unfrequently also occurs upon the arms, shoulders, neck, and breast. The parts least frequently affected are the face and scalp. Sometimes the eruption is scattered, sometimes more or less clustered.

Causes.—Certain irritants produce an eruption of the ecthymatous character by contact with the skin. Tartar emetic has this effect. Artisans whose hands are exposed much to acrid substances are apt to be affected, as workers in metals, dyers, and persons who handle sugar, spices, &c. But generally the disease depends upon causes acting through the system. Hence, infants who are badly or insufficiently fed, and otherwise neglected, are especially liable to be attacked. The depraved condition of health arising from intemperance, from the filth and various wretchedness of extreme poverty, from sensual excesses, and from depressing moral causes, predisposes to the disease. It occasionally follows the eruptive fevers, especially scarlatina and small-pox. Other cutaneous affections, by their irritant influence, not unfrequently cause the development of ecthyma, by which they are then complicated. Such are, especially, lichen, prurigo, and scabies. The disease is said also to occur from the sympathy of the skin with internal irritations.

Diagnosis.—The inflamed and elevated base of ecthyma generally serves to distinguish it from other pustular affections. The disorders with which it may sometimes be confounded are rupia, scabies, and syphilitic eruptions. One of its forms closely resembles *rupia*, when the contents of the bullæ have assumed a purulent character; and there is, indeed, reason to think that they may be essentially the same affection, as they occur sometimes together, and from the same cause. But if the bulla has the vesicular character at any period of its course, it may be considered as rupia. There can be no difficulty in the diagnosis between rupia and the ordinary form of ecthyma. Scabies, even when associated with ecthymatous pustules, may generally be distinguished by the presence of some of its own acuminate vesicles, or the more pointed form of the eruption, if it has assumed the pustular character. In relation to the *syphilitic affection*, the copper colour of the diseased surface, and the history of the case, are sometimes the only diagnostic signs.

Prognosis.—So far as the eruption alone is concerned, though ecthyma is sometimes protracted for several months, it may always be looked on as curable. The only danger is from the frail state of general health, in which the local affection originates.

Treatment.—In the acute disease, little treatment is necessary. Saline laxatives, a light and digestible diet, the avoidance of all stimulants, and the removal of the cause, when discoverable, are the only requisite measures. Warm or mucilaginous baths may be employed as adjuvants. In young and robust individuals, if the inflammation is considerable and very painful, blood may be taken from the arm, and a low diet enjoined.

In chronic cases, the chief care must be directed to the constitution. The digestive organs should be attended to, and the disordered state of the blood corrected. It is often advisable to have recourse to tonics, especially the simple bitters, quinia, the chalybeates, and the mineral acids. Nitromuriatic acid sometimes exerts a favourable influence in these cases. The preparations of sarsaparilla have been employed as alteratives. But the most efficient medicine is probably iodide of potassium, which should be employed especially in the ulcerative cases. Iodide of iron may be substituted when the blood is anæmic Opiates or other narcotics are often necessary, to quiet uneasiness and procure sleep. In the old cases, baths rendered somewhat stimulant by alkaline, ioduretted, sulphuretted, or saline impregnation may be used. The common salt-bath has been recommended. Attention must also be paid to the cause. A wholesome and nutritious diet, and suitable clothing, should be secured to the patient. In children at the breast, it is sometimes important to change the nurse. Of course, strict temperance in all things must be enjoined.

In relation to local measures, while the eruption is inflamed, emollient applications should be employed; in the advanced and ulcerative state, nitrate of silver, the diluted mineral acids, ointment of iodide of potassium, solution of chloride of lime, or other stimulant alterative.

II. IMPETIGO.

Impetigo consists of an eruption of small psydracious or achorous pustules (see *page* 429), generally set closely together, forming thick, yellowish scabs, without contagious properties, and without fever.

The varieties of this affection may be reduced to three, namely, I. figurata, I. sparsa, and I. larvalis. The first two are known commonly as the *moist* or *running letter*, the last is the *crusta lactea* of the older authors.

1. *Impetigo figurata.*—*Moist tetter.*—This may appear upon any part of the body, but is most frequent upon the face, and especially on the cheek. The eruption is sometimes preceded by general uneasiness, headache, or signs of gastro-intestinal irritation, but frequently appears without any previous disorder. It occurs in clusters of minute yellow pustules, of the size of a pin's head or less, closely crowded upon a circumscribed red and inflamed portion of the skin; the redness extending a little beyond the pustules, and the whole patch being slightly elevated above the surrounding surface. There may be one of these patches, or several. In the latter case, they are usually smaller, and, extending by their borders, not unfrequently coalesce. Sometimes they are preceded by an inflammation not unlike that of erysipelas, from which, however, the affection (*I. erysipelatodes*) may very soon be distin-

resolut[illegible] the pustules. In this case, there may be a slight
instead[illegible] extensively over the face and neck.
the h[illegible] pustules break and discharge their contents, leav-
dent [illegible] excoriated surface, which exudes large quanti-
and [illegible] from numerous minute pores. The affection is at-
star[illegible]eable sensations of itching, heat, and smarting.
[illegible] concretes into yellowish, or greenish-yellow, brittle, and
by [illegible] beneath which a liquid matter continues to ooze. It
b[illegible] the complaint generally first comes under the notice of
f[illegible] detects its character, not only by the peculiar appearance
[illegible] but also by a few pustules which generally show themselves
[illegible] of the circumscribed patch. The countenance of the pa-
[illegible]ly altered, so as scarcely to be recognizable, when the erup-
[illegible] extensive on the face.

[illegible]our weeks, the disagreeable sensations and the quantity of fluid
[illegible]sen, and the scabs, becoming dry, fall off, and leave the skin red,
[illegible]ickened, rough, and brittle; so that slight causes of irritation
[illegible] fissures and excoriations, with renewed discharge and scabbing,
[illegible] greatly protract the complaint. But should such sources of injury
[illegible], the diseased surface may gradually resume the healthy condition,
[illegible]t still remains for some time red and shining, with a very delicate
[illegible]. The cure generally begins in the centre of the patches, and extends
[illegible] the circumference. This may be considered as the *acute form*.

[illegible] the disease is often much protracted, and may then be considered chro-
[illegible] though, in fact, the acute character still frequently remains, as the suc-
[illegible]ssive crops of pustules which sustain it appear with the same properties,
and go through the same changes as at first. Sometimes these renewed eruptions appear upon the original surface, thereby at length producing a deep affection of the skin. In other cases, they take place upon the borders of the patch, extending it in all directions, while the interior remains covered with a scaly or scabby incrustation, constituting one of the varieties of *ring-worm*. At length, however, the affection becomes truly chronic, presenting dry scales or scabby surfaces, the origin of which may generally be known by the occurrence now and then, about their edges, of a few characteristic pustules. When a cure takes place, the itching ceases, liquid is no longer secreted, the scabs become thinner and thinner, and at length disappear, and the skin resumes its healthy character, though long somewhat discoloured.

It has been already stated that this variety of the disease occurs most frequently in the face. It may cover the whole of one or of both cheeks, and may even extend to the neck; but occasionally it is confined to some one limited spot, as to the eyelid, the ala of the nose, or the upper or lower lip. When upon the eyelid, it is apt to induce ophthalmia. It occurs also on the limbs, and is said to be usually of smaller extent in the upper than the lower extremities, in the latter of which it sometimes forms several large patches.

2. *Impetigo sparsa.*—This differs from the preceding variety only in the arrangement of the pustules. These are of the same character, and go through the same series of changes; but, instead of being in well-defined patches, they are scattered irregularly over the part affected. The disease is in this form more apt to become chronic. It is also much more frequent in the lower extremities, affecting especially the flexures of the joints. It may be confined to a portion of one limb, or may spread more or less over the whole of it, or may even occupy more than one. In some instances, by the occurrence of successive crops of eruption in the intervals of the preceding, before these have terminated in health, large portions become continuously diseased; and the whole of a limb is sometimes enclosed in a firm yellowish incrustation,

which has been compared to the bark of a tree. In this state, the disease constitutes the *Impetigo scabida* of Willan. The leg from the knee downwards, and the arm from the elbow to the wrist, may thus be encased in a scabby covering, which renders motion difficult and painful. Now and then the crust splits, allowing the ichorous matter to flow out, which in its turn concretes, and adds to the thickness of the covering. When the scabs are removed, the surface appears excoriated, but soon covers itself over with a new crust, by the concretion of the liquid discharge that takes place. Sometimes the disease extends to the fingers and toes, causing a separation of the nails, which, when afterwards renewed, are apt to be notched and misshapen. Obstinate ulcers occasionally form in the impetiginous limb, which is also not unfrequently greatly distended with edematous effusion. This is peculiarly apt to happen in old and feeble individuals, with health broken or depraved by intemperance, bad living, and various diseases.

This variety of impetigo is said to occur most frequently in the autumn, while the I. figurata is most partial to the spring. Some persons are attacked by the former every autumn, and do not get rid of it until the recurrence of warm weather after the close of winter.

It should be recollected that there is no precise line between these two forms, but that they are connected by cases presenting every diversity of shade, and in fact constitute one and the same disease, depending upon the same causes, and requiring the same treatment.

3. *Impetigo larvalis.*—*Porrigo larvalis* (Willan).—*Crusta lactea.*—This affection has been removed by the recent French writers on dermatology from porrigo or favus, to which it was attached by Willan and Bateman, and placed with impetigo. It differs from porrigo essentially in the circumstance of its want of contagiousness, as well as in its pustular character.

This variety of impetigo is confined chiefly to infancy, and, though it may appear on different parts of the body, occurs most commonly upon the face or scalp. Its specific name is derived from the circumstances, that it sometimes covers nearly the whole face with a scabby incrustation, as with a mask. It differs much in its extent, the degree of inflammation that attends it, the thickness of the crusts, &c. The eruption consists of numerous very small, whitish, achorous pustules, which cause much itching, and soon break, either spontaneously or from scratching. A purulent fluid escapes, which concretes into soft, yellowish, or greenish-yellow scabs. As the pustules spread, the scabby surface extends, and is at the same time thickened by the concretion of matter which forms beneath the crust. Beginning in the forehead or cheek, it thus spreads till it sometimes covers the whole face, with the exception of the nose and eyelids. In some instances, it is confined to particular parts of the face. Thus it may cover the chin only, or may form a crust completely around the lips, very much interfering with their motions. If the crust is removed, the surface is seen to be red, inflamed, and excoriated; and it sometimes discharges fluid so copiously that scabs cannot form. In other instances, little fluid secretion takes place, and the crusts are dry, brown, and adherent.

At the same time that it thus chiefly affects the face, patches of the eruption not unfrequently appear on the breast, arms, or other parts of the body. It affects also the ears and scalp; and the cervical glands sometimes become inflamed and enlarged. The disease is also occasionally complicated with inflammation of the eyes, and purulent discharge from the auditory meatus.

In consequence of repeated renewals, or the long continuance of the disease, the skin may become fissured and excoriated, though it is said that, when the parts are restored to health, no scars are left, unless in consequence of wounds made by the fingers. According to Dr. Bateman, however, fissures are less apt to be produced in the skin than in other forms of impetigo.

In the scalp it may be confined to the back part, or pervade the whole. The viscid fluid that is poured out agglutinates the hairs, which are consolidated with the scabs into extensive crusts. From beneath these matter continues to exude; and innumerable vermin find a congenial residence in the filthy mass, which is unspeakably offensive as well to the nostrils as to the eye. It is only, however, in cases in which no regard is paid to cleanliness that the affection assumes so repulsive an aspect. If the hair is cut off, and the scabs removed, the surface appears red, and exhibits numerous exuding points, while here and there are frequently small subcutaneous abscesses. In old cases, the hair partially falls, but, as the bulbs are not destroyed, it grows again; in which respect the disease differs from porrigo. When the pustules are distinct in the scalp, they sometimes terminate in scabs which join several hairs together, and which, upon separating from the skin, become hard, unequal, irregular, and of a brown or dark-gray colour, and remain interspersed in great numbers among the hair, giving it a peculiar appearance. This is the affection described by Cazenave and Schedel as *Impetigo granulata*.

The affection is attended with much itching and irritation, which renders the child fretful and restless, and interferes with sleeping. In this way the general health may at length become affected, and sometimes internal diseases occur, which carry off the patient. This, however, is not common. In general, the health is little impaired; and there is reason to believe that the affection, which is peculiarly apt to occur during dentition, sometimes serves as a useful outlet to the morbid tendencies of that period.

The complaint is often tedious, and sometimes cannot be cured permanently while teething continues. Sooner or later, however, it gets well; the secretion ceasing, the scabs diminishing, and the skin gradually returning to the healthy state, though it long continues red, delicate, and marked with deep lines, and the cuticle repeatedly exfoliates.

Causes.—The causes of impetigo are not always obvious. Dentition appears to dispose to it, as do various conditions in the female connected with the menstrual function, as change of life, amenorrhœa, and sometimes gestation. Young persons of fresh and delicate skins are said to be peculiarly liable to its attacks. Among the exciting causes are enumerated violent exercise, sensual excesses, vehement passions, and various local irritants to which certain artisans are exposed, as dyers, workers in metal, bakers, &c. One of the most frequent causes of its obstinacy is the untimely application of stimulant medicaments, which are unsuitable to the early stage.

Diagnosis.—The complaints with which impetigo is most likely to be confounded are eczema and porrigo. From *eczema* it is distinguished by its pustules, and by its thick, rugose, yellowish or greenish-yellow scabs. If, along with minute pustules, there are also vesicles, succeeded by thin laminated or scaly crusts, the complaint may be referred to eczema impetiginoides; though it is by no means impossible that the two affections may be conjoined. In fact, they are considered by some as identically the same disease; and, at all events, there is a very close analogy between them. The diagnosis between impetigo and *porrigo* will be given under the latter complaint. It has been already stated that the latter is, and the former is not contagious. There can be no difficulty in distinguishing the disease from *scabies* in its ordinary form. The pustules, the patches, the profuse liquid discharge, the copious thick scabs, and the want of the contagious quality are sufficiently diagnostic. In the advanced stages, it is possible that impetigo might sometimes be confounded with the scaly diseases; but the history of the cases will serve to distinguish them, and, besides, by careful watching, some pustules may generally be detected at times among the patches of impetigo, even when in its most chronic state.

Prognosis.—This disease is very seldom dangerous. Even in those cases of infants who perish while labouring under it, the cause of death must almost always be sought for in some merely coincident disease. It is possible that the cutaneous affection may sometimes add the last drop that is wanting to make the cup overflow. But there is reason to believe that it much more frequently acts as a safeguard by giving the morbid tendencies an external direction. Though a cure may be counted on sooner or later, yet it is impossible to determine how soon; for, even when the complaint is disappearing, we cannot be certain that a new crop of pustules may not break out. It may get well in a few weeks, or may continue many months.

Treatment.—In the early stages, this should always be soothing. In relation to general treatment, little is requisite. In persons of vigorous constitution, when there is much local inflammation, it may be proper to take a little blood generally or locally; but this is seldom requisite. It will usually be sufficient to diminish the diet, to give cooling drinks, and to administer now and then a gentle laxative, as magnesia, one of the neutral salts, or a mixture of sulphur and cream of tartar. An occasional purgative dose of calomel may be useful in infantile cases of unusual severity or obstinacy.

The local treatment, in the same stage, should be confined to the keeping of the part perfectly cleansed from all filth, whether extraneous or from its own secretions, and to the use of demulcent or emollient applications. The pus should be carefully wiped away with a very soft sponge, or linen rags; and the surface should be frequently washed with warm water, milk and water, infusion of bran or slippery elm, almond emulsion, or other similar liquid, and, in the intervals, may be protected by some mild unctuous substance or liniment, such as thick cream, ointment of rose-water, spermaceti ointment, or glycerin. When the disease affects the scalp, the hair should be cut close, and emollient poultices applied to remove the scabs, after which the demulcents may be used as above. Sometimes anodyne applications may be made to relieve the irritation; but great care must be taken not to poison the infant through the skin. The liquid preparations of opium, digitalis, hydrocyanic acid, &c., which have been recommended, should be used with caution. When the surface is excoriated, the cerate of subacetate of lead, or ointments made with calamine, or oxide of zinc, may be tried. Benefit may sometimes accrue from solutions of gutta-percha or caoutchouc in chloroform, which leave a pellicle on the surface, and thus exclude the air. Absorbent powders may be used for the same purpose, as well as to obviate the effects of the acrid secretion. Cazenave employs oxide of zinc mixed with fifteen parts of starch, the surface having been previously well washed with a weak alkaline solution and dried. A thorough application of cod-liver oil to the diseased surface, as in obstinate prurigo, has sometimes proved effectual.

When the disease is more advanced, other measures should be resorted to. In relation to constitutional treatment, much good may sometimes be done by a proper attention to the general state of health, and by the use of certain alteratives. Should the patient be feeble, recourse should be had to the tonics. Of these the nitromuriatic acid sometimes acts very happily, from its effects in improving the depraved blood. Should the digestive system or hepatic secretion be disordered, it should be restored to a sound state. As alteratives, sarsaparilla, iodine, mercury, and arsenic may be tried; but the three latter should not be used except in decidedly chronic and obstinate cases, and in these always with caution. The waters of sulphur springs may also be used. Solution of chloride of calcium has been recommended in scrofulous cases; and cod-liver oil may be employed under similar circumstances. Chlorate of potassa has been found useful.

Locally, recourse may now be had to stimulant applications; their strength accommodated to the circumstances of the case. It is best to begin with the mildest and advance, if necessary, to the more active. The mineral acids much diluted, weak solutions of the alkaline carbonates, magnesia in an unctuous form, a very dilute solution of nitrate of lead, or ointment of nitrate of mercury weakened with six or eight times its weight of lard, may be used. Should these prove insufficient, and the parts not be irritated by them, trial may be made of nitrate of silver, the mineral acids of such a strength as to be very slightly caustic, ointment of iodide of sulphur, undiluted ointment of nitrate of mercury, or the other stimulant preparations of the same metal. In Guy's Hospital, London, they are said to employ very advantageously a compound ointment called "*unguentum metallorum*," consisting of equal parts of ointment of oxide of zinc, mild ointment of nitrate of mercury, and cerate of acetate of lead. Sanguinaria is said to have proved beneficial. In cases attended with thick incrustation, jets of warm aqueous vapour, or the hot water douche, may be used in connection with emollient poultices to soften and remove the scabs; after which some of the applications above mentioned should be made, beginning with the ointments of zinc or lead, and resorting afterwards if necessary to the more stimulating. In the scaly stage, I prefer tar ointment to all others. A blister to the diseased surface has been recommended. Alkaline and sulphuretted baths are said to have proved beneficial; and the salt-water bath has sometimes effected cures.

III. ACNE.

There are several pustular affections which have this in common, that they are seated in the cutaneous follicles, but differ so much in appearance as to merit distinct names. Such are the complaints called severally *acne*, *rosacea*, and *sycosis*. The first two are included under acne by Willan, Bateman, Biett, and others. Rayer considers them separately, and his example is here followed. Mr. Plumbe has shown that they consist essentially of inflammation of the follicles, or at least has rendered the fact in the highest degree probable. Willan and Bateman place them among the tubercules; but they are now universally admitted to be truly pustular; the tuberculated condition which they sometimes assume being secondary. *Sycosis*, though seated in the hair follicles, has been ascertained to be produced by a microscopic fungus, and is therefore placed with the parasitic affections.

Acne (from ἄκμη, vigour of life) is a chronic eruption of scattered pustules, with inflamed and hardened bases, terminating frequently in tubercules, and seated probably in the sebaceous follicles. It occurs upon the face, neck, shoulders, and anterior and posterior portions of the chest, sometimes extending down the back almost throughout its whole length. The upper part of the back is probably, as a general rule, most affected. Sometimes the pustules appear on the back of the arms. They very rarely occur upon the lower part of the trunk, and almost never upon the lower extremities, though said sometimes to affect the follicles of the scrotum. They are usually first observed upon the face, especially the forehead, nose, and region of the masseters, though they may have previously existed between the shoulders unnoticed.

At first small pimples are seen, entirely distinct, generally red at the base, but without pain, and with little or no uneasiness of any kind. The system at large is not perceptibly affected In some instances, the pimples appear in small numbers and successively; in others, they break out abundantly, and almost cover the face. The skin between them often has an oily appearance. At first about the size of a pin's head, they gradually enlarge and become red, shining, and somewhat painful to the touch. Suppuration takes place slowly, and it is often a week or more before pus is formed. This is usually small in quantity, and quickly dries into a minute scab, which, upon separating, leaves a small, red, somewhat elevated spot, that ultimately disappears. The whole process occupies about three weeks. The pustules are renewed at intervals for an indefinite time, and in some cases are never quite wanting. This is the simplest form of the affection, answering to *Acne simplex* of Willan.

The complaint often occurs in a severer form, denominated *Acne indurata* by Willan. The follicles are more inflamed, the pimples are larger, and suppuration takes place more slowly, occurring at various periods from ten days to three weeks. Sometimes several neighbouring follicles appear to unite, and form a small tumour of the size of a large pea, or even of a hazelnut. After suppuration, the pustule, instead of subsiding entirely, often leaves a hard tubercule of a violet red colour, which is long in undergoing resolution. The inflammation extends in spots to the subcutaneous areolar tissue, which becomes hardened here and there, and gives irregularity to the surface. Sometimes only a few of these tubercules appear; sometimes they are numerous, covering particular portions or nearly the whole of the face. Between the tubercules are numerous smaller prominences, some in the state of pimple, some in that of pustule, others with minute scabs; and interspersed among these are also the red spots left by the retroceding eruption, and whitish oblong scars resulting from former pustules. Besides these various appearances, there are very often not only in this, but also in the simpler form, numerous black points, surrounded by a more or less prominent circle of cuticle, which are the orifices of sebaceous follicles, distended with their peculiar secretion. From these the sebaceous matter may be pressed out in the form of small worms with a black head; and, not unfrequently, the escape of this matter is preceded by a gush of pus through the same orifice. The affection, when presenting this appearance, is denominated *Acne punctata* by Willan. In some instances, the sebaceous matter is exuded so abundantly as to produce crusts over considerable portions of the surface, forming the *Acne sebacea* of Biett.* All the phenomena above described, constituting different stages or degrees of follicular inflammation or excitement, may appear at the same time upon any of the parts frequented by the disease, and when on the face give it a very disagreeable and even repulsive aspect.

The affection, in this form, may continue for months or years, varying in degree, sometimes, perhaps, disappearing and again returning, until at length the constitutional tendency seems to be exhausted, and the patient slowly recovers, often, however, retaining indelible marks of the disease. At no time is it necessarily attended with any observable constitutional disorder.†

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* *Ichthyosis spuria* vel *sebacea*.—Under this name, Dr. J. W. Ogle describes, in the *Lancet* (July, 1863, p. 69), two cases of sebaceous secretion, which closely resembled ichthyosis in appearance, but seem to me rather to have belonged to the variety of Acne mentioned in the text. A roughness and dryness of certain parts of the skin, especially about the elbows, knees, and down the legs, was followed by a dark-brown incrustation, which was broken up into small tabular or lozenge-shaped pieces, divided by deep lines, corresponding with the natural creasings of the skin. These incrustations consisted of sebaceous matter, darkened, no doubt, in the same manner as the black points of the same matter in acne punctata. The treatment consisted of the warm bath daily, and friction with Galium aparine and lard, followed by alkaline lotions, under which the patient recovered. (*Note to the sixth edition.*)

† *Acne atrophica*.—An affection denominated *atrophic acne* has been described by M. Chausit, of Paris, which, though not inflammatory in its character, cannot be considered anywhere more appropriately than in this place. It appears to be one of the varieties of M. Cazenave's *erythematous lupus*, originally described by M. Biett as a variety of erythema. It is considered by M. Chausit as a disease of the sebaceous follicles, characterised at first by an excessive secretion, giving rise to hard and very adhesive crusts, which cover circumscribed portions of reddened and oily skin, and subsequently by atrophy of the follicles, and a consequent white, scar-like depression of the skin, which, after a long time, is again filled up by a work of reparative nutrition. The affection begins as

being graduated to the circumstances of the case. It is best to begin with the mildest and advance, if necessary, to the more active. The mineral acids very much diluted, weak solutions of the alkaline carbonates, magnesia in an unctuous form, a very dilute solution of nitrate of lead, or ointment of nitrate of mercury weakened with six or eight times its weight of lard, may be used. Should these prove insufficient, and the parts not be irritated by them, trial may be made of nitrate of silver, the mineral acids of such a strength as to be very slightly caustic, ointment of iodide of sulphur, undiluted ointment of nitrate of mercury, or the other stimulant preparations of the same metal. In Guy's Hospital, London, they are said to employ very advantageously a compound ointment called "*unguentum metallorum*," consisting of equal parts of ointment of oxide of zinc, mild ointment of nitrate of mercury, and cerate of acetate of lead. Sanguinaria is said to have proved beneficial. In cases attended with thick incrustation, jets of warm aqueous vapour, or the hot water douche, may be used in connection with emollient poultices to soften and remove the scabs; after which some of the applications above mentioned should be made, beginning with the ointments of zinc or lead, and resorting afterwards if necessary to the more stimulating. In the scaly stage, I prefer tar ointment to all others. A blister to the diseased surface has been recommended. Alkaline and sulphuretted baths are said to have proved beneficial; and the salt-water bath has sometimes effected cures.

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Acne (from ἀκμη, vigour of life) is a chronic eruption of scattered pustules, with inflamed and hardened bases, terminating frequently in tubercules, and seated probably in the sebaceous follicles. It occurs upon the face, neck, shoulders, and anterior and posterior portions of the chest, sometimes extending down the back almost throughout its whole length. The upper part of the back is probably, as a general rule, most affected. Sometimes the pustules appear on the back of the arms. They very rarely occur upon the lower part of the trunk, and almost never upon the lower extremities, though said sometimes to affect the follicles of the scrotum. They are usually first observed upon the face, especially the forehead, nose, and region of the masseters, though they may have previously existed between the shoulders unnoticed.

At first small pimples are seen, entirely distinct, generally red at the base, but without pain, and with little or no uneasiness of any kind. The system at large is not perceptibly affected In some instances, the pimples appear in small numbers and successively; in others, they break out abundantly, and almost cover the face. The skin between them often has an oily appearance. At first about the size of a pin's head, they gradually enlarge and become red, shining, and somewhat painful to the touch. Suppuration takes place slowly, and it is often a week or more before pus is formed. This is usually small in quantity, and quickly dries into a minute scab, which, upon separating, leaves a small, red, somewhat elevated spot, that ultimately disappears. The whole process occupies about three weeks The pustules are renewed at intervals for an indefinite time, and in some cases are never quite wanting. This is the simplest form of the affection, answering to *Acne simplex* of Willan.

The complaint often occurs in a severer form, denominated *Acne indurata* by Willan. The follicles are more inflamed, the pimples are larger, and suppuration takes place more slowly, occurring at various periods from ten days to three weeks. Sometimes several neighbouring follicles appear to unite, and form a small tumour of the size of a large pea, or even of a hazelnut. After suppuration, the pustule, instead of subsiding entirely, often leaves a hard tubercule of a violet red colour, which is long in undergoing resolution. The inflammation extends in spots to the subcutaneous areolar tissue, which becomes hardened here and there, and gives irregularity to the surface. Sometimes only a few of these tubercules appear; sometimes they are numerous, covering particular portions or nearly the whole of the face. Between the tubercules are numerous smaller prominences, some in the state of pimple, some in that of pustule, others with minute scabs; and interspersed among these are also the red spots left by the retroceding eruption, and whitish oblong scars resulting from former pustules. Besides these various appearances, there are very often not only in this, but also in the simpler form, numerous black points, surrounded by a more or less prominent circle of cuticle, which are the orifices of sebaceous follicles, distended with their peculiar secretion. From these the sebaceous matter may be pressed out in the form of small worms with a black head; and, not unfrequently, the escape of this matter is preceded by a gush of pus through the same orifice. The affection, when presenting this appearance, is denominated *Acne punctata* by Willan. In some instances, the sebaceous matter is exuded so abundantly as to produce crusts over considerable portions of the surface, forming the *Acne sebacea* of Biett.* All the phenomena above described, constituting different stages or degrees of follicular inflammation or excitement, may appear at the same time upon any of the parts frequented by the disease, and when on the face give it a very disagreeable and even repulsive aspect.

The affection, in this form, may continue for months or years, varying in degree, sometimes, perhaps, disappearing and again returning, until at length the constitutional tendency seems to be exhausted, and the patient slowly recovers, often, however, retaining indelible marks of the disease. At no time is it necessarily attended with any observable constitutional disorder.†

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* *Ichthyosis spuria* vel *sebacea*.—Under this name, Dr. J. W. Ogle describes, in the *Lancet* (July, 1863, p. 69), two cases of sebaceous secretion, which closely resembled ichthyosis in appearance, but seem to me rather to have belonged to the variety of Acne mentioned in the text. A roughness and dryness of certain parts of the skin, especially about the elbows, knees, and down the legs, was followed by a dark-brown incrustation, which was broken up into small tabular or lozenge-shaped pieces, divided by deep lines, corresponding with the natural creasings of the skin. These incrustations consisted of sebaceous matter, darkened, no doubt, in the same manner as the black points of the same matter in acne punctata. The treatment consisted of the warm bath daily, and friction with Galium aparine and lard, followed by alkaline lotions, under which the patient recovered. (*Note to the sixth edition.*)

† *Acne atrophica.*—An affection denominated *atrophic acne* has been described by M. Chausit, of Paris, which, though not inflammatory in its character, cannot be considered anywhere more appropriately than in this place. It appears to be one of the varieties of M. Cazenave's *erythematous lupus*, originally described by M. Biett as a variety of erythema. It is considered by M. Chausit as a disease of the sebaceous follicles, characterised at first by an excessive secretion, giving rise to hard and very adhesive crusts, which cover circumscribed portions of reddened and oily skin, and subsequently by atrophy of the follicles, and a consequent white, scar-like depression of the skin, which, after a long time, is again filled up by a work of reparative nutrition. The affection begins as

Causes.—The chief cause of acne is probably some modification of the vital processes, during the period which intervenes between puberty and full maturity of growth. At this period, when the functions are gradually settling down from a state of high activity into the regularity of mature age, excesses or irregularities in the vital actions not unfrequently occur, which find an outlet in various local diseases, of which one of the safest is undoubtedly that now under consideration. Hence, young persons of both sexes are peculiarly liable to the disease, which is most common from the seventeenth or eighteenth up to the twenty-fifth year, though it not unfrequently happens as late as thirty or even thirty-five. The notion is, I think, altogether gratuitous, and highly injurious to the good name of the young, which ascribes the disease to secret and vicious indulgences. On the contrary, it frequently occurs in persons of health in all other respects perfectly sound, and of the most correct characters; and I have certainly not noticed it as peculiarly attendant upon cases in which such vices have been acknowledged.

It is no doubt true that, in those predisposed to the affection, it is induced by intemperance in eating and drinking; and it is very intelligible that, in females, it should be more apt to occur when the menses are retained or suppressed, than in the healthy state of that function. It is supposed to be caused in some instances by disordered digestion. Local irritation may also sometimes call the predisposition into action.

Diagnosis.—Acne may in general be easily distinguished. The only affections liable to be confounded with it are ecthyma, and syphilitic pustules and tubercules. The pustules in ecthyma are larger and more superficial than those of acne, have a much thicker scab, and do not, like the latter, leave chronic tubercules behind them. Nor are they accompanied with thickening and induration of the subcutaneous areolar tissue. The syphilitic pustule and tubercule are apt to be surrounded with a copper-coloured areola, appear on other parts of the body as well as in the ordinary seats of acne, and are besides preceded or accompanied with other symptoms which sufficiently indicate their nature. Besides, the syphilitic tubercules are often ulcerated at top.

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a circumscribed red spot, which covers itself with thin, whitish, strongly adherent crusts, little raised above the surface of the skin. After a considerable time, the redness is deepened, and the crusts become thicker, darker, as it were cretaceous, and surrounded by an erythematous border. Examined closely, the crusts are found to consist of numerous points of concrete sebaceous matter, each corresponding with the dilated orifice of a follicle. When they are forcibly removed, the skin appears red and oily, and filled with little funnel-shaped apertures, which are the openings of the glands. The next change is a gradual diminution of the crusts, which become thinner and thinner, and are at length scarcely visible. The surface is now depressed, and presents a honeycomb appearance, with numerous brownish points, which continue for a long time. When the series of atrophic changes is complete, the scar-like surface is white; more or less reticulated, if upon a soft part, as on the cheek; but shining, uniform, tense, and as it were transparent, if upon a firm part, as the nose, and surrounded by a prominent, erythematous border. The course thus far has occupied one or two years or more. After this, the depressed surface becomes vascular, assumes a uniform rose colour, and gradually rises to the level of the cuticle, when all appearance of depression is lost, and nothing is left to indicate the spot but some remaining redness, especially at the centre. The affection is thus seen to have a course of over-action, atrophy, and ultimate restoration, which, though it may occupy several years, is invariable if the disease be left to nature.

M. Chausit ascribes the depression to atrophy of the sebaceous follicles, after their excessive secretion, and to the partial disappearance of the interfollicular tissue, under the pressure of the distended glands. The reticular appearance is owing to remains of the proper cuticular structure between the glands; and the brownish dots, seen at a certain stage, represent the bottom of the follicles which have been destroyed.

The cause of the affection is unknown; but M. Chausit has convinced himself that it is not connected with a scrofulous diathesis, and is exclusively a local disease, which may coexist with a sound state of the general health. It does not appear to have been in any degree influenced by treatment. (*Arch. Gén.*, Avril, 1858, p. 885.)—*Note to the fifth edition.*

Nor are they interspersed with those enlarged sebaceous follicles, or attended with that greasy state of the skin, so characteristic of acne.

Prognosis.—The simple form of the disease is often of brief duration; but it is often also obstinate and persistent; and the severer form sometimes lasts for many years. It is impossible in any case to prognosticate with accuracy the period of recovery. The patient, however, may be assured that he will get well in time; for it almost never happens that, with a proper attention to regimen and modes of life, the disposition to the disease does not spontaneously cease, with the changes which the system undergoes.

Treatment.—Very little should be done in the milder cases. In those of greater severity, the physician, even if disposed, cannot resist the appeals constantly made to him by the very excusable regard of the patient for his personal appearance. But he should always bear in mind that this affection may be a safe outlet for tendencies to irritation, possibly to tuberculous deposition, and should, therefore, be guarded in the measures employed.

In relation to general remedies, it is usually sufficient, in the early stages, to obviate costiveness by saline laxatives, to restrict the patient to a moderate and easily digestible diet, and to forbid strictly all stimulating drinks and high-seasoned food. Any disorder of menstruation, digestion, or other important function, should be corrected by the appropriate means. Should the inflammation be severe, and the patient vigorous or plethoric, it would be proper to take blood both from the arm, and by leeches from the neighbourhood of the affected part, as, for example, from behind the ears in acne of the face. Under the same circumstances, the diet may be still further reduced, and a dose of sulphate of magnesia occasionally administered. The habitual use of the warm bath may also be advantageous. Should the patient, on the contrary, be feeble, it may be necessary to support his strength by mild tonic measures, adapted to the circumstances of his case. Among these the cold bath is one of the best. In the advanced stages, when the disease has become quite chronic, recourse may be had to the alterative influence of iodide of potassium, iodide of iron, iodide of mercury, compound syrup of sarsaparilla, &c. Mr. Startin has obtained great success, in the Hospital for Diseases of the Skin, in London, by the conjoined use of the preparations of iron and saline aperients. (*Med. Times and Gaz.*, vi. 24.) Should there be suspicion of a scrofulous taint, cod-liver oil would be additionally indicated.

The local treatment should at first be soothing. Emollient or demulcent lotions may be used occasionally through the day, such as glycerin, infusion of bran or slippery elm, emulsion of bitter almonds, warm milk, cream, &c. When considerable extents of surface are affected, demulcent baths may be useful. An emollient poultice, as of bread and milk, mashed potatoes, mush, &c., may be applied to the face at night. Wilson has found advantage from the application of collodion, so as to protect the surface from the air. A solution of gutta-percha or caoutchouc in chloroform is still better. As the complaint advances, and the eruption assumes a more indolent character, disposed neither to suppuration nor to resolution, gently stimulant applications may be made; such as alcohol diluted with one of the aromatic waters; diluted spirit of lavender, bay rum, or Cologne water; a solution of corrosive sublimate in alcohol or water, in the proportion of from half a grain to two grains to the pint, &c. Dr. Neligan thinks that the best method of preventing acne is to wash the face, in the morning, with a solution of carbonate of soda instead of soap, and afterwards with a lotion consisting of two drachms of oil of lemon, and half a drachm of oil of rosemary, dissolved in half a pint of alcohol. (*Dub. Quart. Journ. of Med. Sci.*, xi. 330.) Mr. Plumbe strongly recommends that each tubercule, as soon as it assumes a bluish hue indicative of suppuration, should be opened by a lancet, and the matter pressed out. The same end may often be effected by pressure alone without puncture. At a still later period, the ointment of nitrate of mercury, of ammoniated mercury, or of iodide of sulphur should be used. Biett praises highly the last-mentioned preparation, made in the proportion of from twelve to twenty-four grains of the iodide to an ounce of lard. At this stage, too, it is that lotions of one of the natural sulphur waters, or the douche of hot vapour or hot water, continued for fifteen or twenty minutes, have been found beneficial in exciting the languid tubercules into a more rapid action. The use of vapour baths, and sulphur baths, has also been recommended. A blister applied to the diseased follicles has sometimes had a powerful influence in promoting their resolution. In despair of benefit from other means, nitrate of silver, and the strong mineral acids have sometimes been employed with a view to their caustic effect. Muriatic acid, applied in such strength as the skin can bear without being cauterized, either alone or in connection with glycerin, and washed off after momentary contact, has been specially recommended. I should prefer, previously to the use of these caustic remedies, a trial of the tincture of iodine applied repeatedly to the diseased surface. When any of the above measures occasion much inflammation, they should be suspended for a time.

IV. ROSACEA.

Syn.—*Acne rosacea* (Bateman, Cazenave).—*Gutta rosea.*—*Couperose* (French).

THIS is strikingly peculiar in its appearance. An affection sometimes occurs in the young, consisting of isolated and scattered pustules of acne, upon a broad, hard, and red base, with redness of the intervening skin, which, though described by authors under this head, appears to be intermediate between acne and rosacea, and, from the circumstance that it occurs at the same age, might properly be referred to the former complaint. If it be so referred, it would be entitled to the name of *Acne rosacea*. Rosacea, as the term is here understood, is confined almost exclusively to persons in middle or advanced life.

The disease usually appears first upon the nose, especially the end of it, though it may begin also in other parts of the face. The skin in the part affected assumes a deep-red colour, most commonly after some excess in drinking or eating. The redness disappears after a time, but returns upon some similar occasion, and this may happen several times, until at length the colour becomes permanent. Pustules now appear upon the surface, and, by their yellowness, sometimes offer a striking contrast with the purple redness around them. The skin swells unequally, the part affected often enlarges considerably, and deeper-red or bluish streaks, caused by the enlarged capillaries, meander over the surface. In some instances, the affection continues confined to the nose, but in others it extends to the cheek, forehead, chin, and even to the whole face, which is then all over red, though with unequal intensity in different spots. The redness is deepest about the pustular eminences, which often assume a tuberculated condition, neither inclined to suppuration nor to resolution. The whole surface affected is unequal, rugose, and of a peculiarly disagreeable and repulsive appearance.

Cause.—This affection is generally the result of intemperate drinking or eating, or of both. It is also said to be produced by excessive mental labour with confinement, and especially when combined with the indulgences of the table. Disorder of the digestive process is apt to accompany, and may possibly promote it. Individuals have been observed to be peculiarly prone to it, whose parents have been affected in the same way. Women are especially liable to it about the period of the cessation of the catamenia.

Prognosis.—The complaint often ceases for a time, but it is very apt to return; and, when of long standing, is exceedingly obstinate, if not incurable. The prognosis is favourable inversely in proportion to the age of the patient, and the duration of the disease. When it depends upon intemperance, there may be more hope of cure from a change of habit, than when it arises from constitutional peculiarities.

Treatment.—There may be cases of the disease in which the general health is so vigorous as to admit of bleeding; but they are rare. Occasional leeching near the part affected may be useful in some instances. The measure upon which most depends is a complete change of habits. If the patient, upon the occurrence of the disease, can be prevailed on to adopt a temperate course of life, there is reasonable ground to expect a cure. A bland diet of boiled meats, milk, and digestible vegetables and fruits should be enjoined. The course of general treatment must be conducted in reference to the state of system, without particular regard to the local affection. It is said that good has resulted from the nitromuriatic acid foot-bath; and the alterative influence of mercury, or iodine, or of both conjoined, may be tried. Donovan's solution has been especially recommended. In the *Lancet* for August, 1864 (p. 199), Mr. T. Foster Kerr states that he has had remarkable success with the use of horseradish. He gives internally two fluidounces of the compound infusion of the London Pharmacopœia, with a little spirit of ammonia and syrup of ginger, morning and evening, and washes the part frequently with an infusion of the root in milk.

In relation to the local treatment, the remarks made under acne are exactly applicable here. In the early and more inflammatory stage, the emollient plan should be adopted, and should afterwards be exchanged gradually for the stimulant, as the affection becomes indolent. A lotion made by mixing one part of camphor pulverized by means of alcohol, first with two parts of lac sulphuris, and afterwards with sufficient distilled water, has been recommended by Dr Morris, of England, as highly efficacious. It is to be applied night and morning, and persevered with as long as the affection continues. Its good effects are said to be soon observable. (*Lancet*, March 4, 1855.) A compound of iodide and chloride of mercury (*iodo-chloride of mercury*) is said to have been employed with much success in the treatment of rosacea by Dr. Rochard, in France. He uses it first externally in ointment, and if this does not succeed superadds the internal use.* M. Devergie also has found it very efficacious. M. Delvaux has cured *couperose*, in many instances, by cajeput oil. He applies it, by means of a hair pencil, over the whole affected surface, the patient lying on his back to prevent irritation of the eyes from its vapours, and repeats the application three times daily. (*Ann. de Thérap.*, A.D. 1862, p. 46.)

Article V.

SCALY DISEASES.

FOUR scaly diseases are usually classed together; namely, psoriasis, lepra, pityriasis, and ichthyosis. Of these, the first two are so analogous in symptoms, character, and treatment, that they might, without impropriety, be considered as varieties of the same disease; and ichthyosis is so different from the others as to have been separated from them by Rayer, and treated of under hypertrophy of the skin. Without stronger reasons, however, it is perhaps best not to disturb an arrangement established by the great English dermatologist, and in which authors generally seem disposed to acquiesce.

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* Iodo-chloride of mercury is made with one equivalent of iodine and two of calomel. The calomel, coarsely powdered, is heated in a matrass till it begins to sublime, and the iodine is then added by degrees. The union takes place with some noise. The ointment is prepared by rubbing one part of the powder with eighty of lard. It is applied daily, until its effects are experienced. The first effect is to irritate, and produce copious exudation, which is converted into crusts. These after a time fall, leaving the surface improved. The application is then renewed, and persevered with until the cure is complete. Should the local treatment prove insufficient, one-sixth or one-seventh of a grain of the iodo-chloride may be given internally, once, twice, or three times daily, in the form of pill or syrup. (*Arch. Gén.*, Janv. 1857, p. 91.)—*Note to the fifth edition.*

I. PSORIASIS.

This term, derived from the Greek word *ψωρα*, which signifies a cutaneous eruption, supposed by some to be scabies, was applied by Willan to a disease of the surface, characterized by slight elevations of the skin, surmounted by whitish scales, and not depressed in the centre. It appears in several forms, which, however, are often only different stages of the same affection.

Symptoms, Course, &c.—In the mildest form (*Psoriasis guttata* of Willan), it appears first in small papulous elevations often not larger than a pin's head, the summit of which is soon covered with a slight whitish scale. Many of these break out at the same time. They gradually increase in size till from two to four lines in diameter; continuing quite distinct, and appearing somewhat like isolated drops of liquid scattered upon the skin. Their form is irregularly circular; and, when freed from their scales either spontaneously or by the nails in scratching, they present a bright-red, somewhat painful, and slightly elevated surface, which quickly again covers itself with scales. They may occur upon all parts of the body, but are most frequent on the back and limbs. They are attended with some itching, especially when the patient is warm in bed.

Sometimes, instead of having the distinct form just described, the little red elevations occur so numerously, and so near together, that they necessarily coalesce as they grow, and thus form large irregular surfaces, which are covered with scales of various thickness and adhesiveness, and sometimes exhibit remains of the original papulous elevations within their boundaries. This is the *Psoriasis diffusa* of Willan. When freed from the scales, the patches are red, rough, and chapped. They are often very large, sometimes covering the whole anterior surface of the leg, or posterior surface of the forearm, and especially affect the knee and elbow. Occasionally the patches are seen without any elevation, merely presenting irregularly circumscribed surfaces, covered with minute thin scales. Though most frequently observed upon the extremities, they sometimes show themselves on the back and abdomen, and may indeed occur in any part of the body, but are not common in the face. They are attended with burning, tingling, and a very troublesome itching, especially when the patient is near a fire. Sometimes they become inflamed, the surface is more elevated, the scales thicken, and the skin cracks into fissures, which are painful, and bleed upon movement.

A still worse form of the disease (*Psoriasis inveterata* of Willan) results from long neglect, from the continued operation of the cause, or from the peculiar constitution of the patient, as in the old, the intemperate, and persons broken down by bad habits of life, or by hardships and privations. In this, the skin is inflamed, thickened, and intersected in all directions with furrows, which are often deep, and filled by a white powdery matter. Immense quantities of scales are produced, which readily separate, so that the bed is sometimes found full of them in the morning. In some instances, the surfaces are nearly destitute of scales, red, rough, and unequal. The affection may be confined to the limbs; but sometimes extends to the whole surface, except, perhaps, the face, palms of the hands, and soles of the feet; and occasionally the body seems as if furnished with a complete scaly case. In this form of the disease, the motions are often much constrained and painful, producing cracks and fissures in the vicinity of the articulations, which frequently bleed, and become very sore and tender, so that the patient is compelled to keep chiefly to his bed.

In another, but very rare form of the disease (*Psoriasis gyrata* of Willan), the eruption, instead of assuming the shape of broad irregular patches, or small circles, appears in narrow strips, sometimes nearly straight, sometimes contorted and vermicular, and occasionally in rings.

Not unfrequently, psoriasis is quite local, occupying a limited space, and only that, and receiving different names according to its position. Sometimes it appears exclusively on the face (*P. facialis*), especially on the forehead, nose, and back part of the cheeks, where it forms thin scales of considerable size, upon red and somewhat painful surfaces, which are often little if at all elevated; and the scales, instead of being white, are often of a light yellowish-brown, or tawny hue. It may be confined to the vicinity of the eye (*P. ophthalmica*), where it is seen in the form of minute scales at the angles of the eyelids, and upon the lids themselves, rendering them stiff on movement, and inducing more or less inflammation of the conjunctiva. Another seat of the disease is the lips (*P. labialis*), around which it sometimes forms a circle of about half an inch in width, with furrows converging towards the mouth, so as to give it a puckered appearance. The epithelium forms thick scales, which frequently exfoliate, and the lips are apt to be affected with fissures, which bleed and occasion pain when the part is moved. In the palm of the hand (*P. palmaria*), it appears either in distinct, red, and elevated spots, which coalesce and exfoliate; or as a single patch, inflamed, hot, and somewhat painful, which covers itself with a white scale, and extends, by additions to its circumference, till it occupies the whole palm, and even the anterior surface of the fingers; while the central portion, exfoliating, shows a purplish-red, thickened, stiff, and tender surface, with deep furrows and fissures, rendering every movement of the fingers painful. Another affection of the hands is that vulgarly denominated *grocers' itch* (*P. dorsalis*), which is situated upon the back of the hand and fingers, causing large, hard, and dry scales, and deep and painful cracks about the knuckles. The nails, when affected by the disease in their matrix (*P. unguium*), become distorted, lamellated, rough, unequal, and yellowish, exhibit a whitish powder about their roots, and sometimes give place to irregular scaly incrustations. The disease is occasionally confined to the prepuce or scrotum (*P. præputii*, and *P. scrotalis*), rendering the skin of these parts rough, scaly, cracked, and inexpansible, and, in the prepuce, sometimes giving rise to phymosis.

In the milder forms, and in those confined to particular parts, there is little or no constitutional disturbance; and the general health is often very good. The severer forms are sometimes preceded by general uneasiness, feverishness, headache, &c., which disappear when the eruption is established. In the inveterate variety, the mucous membranes sometimes become inflamed, especially that of the bowels; though, even in this form, the appetite is not unfrequently unimpaired, and the strength wonderfully preserved for many years.

When the disease terminates favourably, there is a gradual subsidence of the symptoms; the patches begin to return to the healthy state in the centre; the circumference is often broken into fragments by the advancing cure; and at last the whole surface returns to the natural state, except that a yellowish-brown stain is often left for some time.

Causes.—These are for the most part obscure. It is admitted on all hands that the disease is not contagious. There appears to be in some a hereditary tendency to it. From the circumstance that it occurs most frequently among the wretchedly poor, it is supposed that its attack is favoured by the privations, hardships, and uncleanly habits incident to extreme indigence. Nevertheless, the disease also occurs among persons who live well, and pay the strictest attention to cleanliness. It has been thought that the use of certain kinds of food, as salt meat and fish, vinegar, sour fruits, and acescent vegetables, has produced it in certain individuals. It seems to have been sometimes called into action by strong emotions, and by cold water taken by persons greatly overheated. It occasionally alternates, or is associated with gout and rheumatism. The local varieties are induced by local irritants, as in the instance of psoriasis of the hand, which is ascribed to the irritation of powdery substances frequently applied to that part. The time of year seems to have some influence; as the complaint occurs most frequently in the spring and autumn; and it has been observed that certain mild cases are apt to leave the patient upon the approach of very hot and very cold weather, and to return again at the former seasons. Both sexes and all ages are liable to the disease. It is most frequent in adults, though children, particularly those in the humblest stations of life, are occasionally attacked, and Willan has a distinct variety of the disease under the name of *P. infantilis*.

Diagnosis.—The diagnosis between this complaint and leprosy, as well as pityriasis, will be considered under these two diseases. From *lichen circumscriptus*, psoriasis is distinguished by its want of pimples, some of which may almost always be seen in the former complaint. An eruption of a syphilitic character, which bears some resemblance to psoriasis guttata, may be distinguished by its copper colour, the absence of scales or their extreme minuteness, and by concomitant symptoms.

Prognosis.—This is always favourable in the milder forms, under proper treatment. The disease often speedily gets well; but it must be acknowledged that it is sometimes very obstinate. The inveterate form, especially in constitutions broken down by old age or other causes, but too frequently resists almost every variety of treatment. Sometimes psoriasis gets well spontaneously, and sometimes is superseded by other diseases, as by measles or erysipelas. It often runs on for years. It is never fatal unless complicated with internal disease, as gastro-intestinal inflammation. In this way it is sometimes fatal in the old. It is very liable to return after having been apparently or really cured.

Treatment.—In the threshold of the treatment, it should be borne in mind that repellent remedies, in the early stages and acute varieties, may do harm by inducing internal disease. I have seen a case in which pericarditis seemed to follow even the cautious application of tar ointment. It is safest, therefore, to trust the disease at first to general remedies and the mildest local measures. I shall consider the general and local remedies separately.

Should the patient be vigorous, with a strong pulse, and considerable inflammatory excitement in the eruption, it might be advisable to bleed moderately from the arm. Purgatives may be employed with advantage. A moderate dose of sulphate of magnesia, or other saline cathartic, may be given twice or three times a week, and continued for a considerable time, unless it should too much reduce the strength, or irritate the alimentary mucous membrane. In the cases of children, calomel in doses of from two to four or six grains, followed by castor oil, and repeated as the strength will permit, is among the most efficacious remedies. Should the bowels be torpid, recourse may be had to the more active purgatives, as senna, jalap or its extract, resin of podophyllum, compound extract of colocynth, croton oil, &c.; and the compound cathartic pill, which combines several of these, is an eligible preparation. Purging is useful not only by depletion, but probably still more by revulsion. Acetate of potassa, in the dose of half a drachm three times a day, has been found very useful. (Easton, *Ed. Month. Journ. of Med. Sci.*, May, 1850, p. 428.) The diet, under the same circumstances, should consist of vegetable substances, or of these with milk. Everything stimulant should be avoided, and cooling drinks, and rest as far as possible, enjoined.

In connection with this antiphlogistic course, the decoction of dulcamara may be employed internally. Half a pint in divided doses may be given at first during the day, and gradually increased to a pint. I have used this remedy frequently, and it has appeared to contribute much to the cure. Among its effects are a general reduction of the force of the circulation, and a particular reduction of the capillary circulation of the skin. It is, therefore, calculated to produce the very effect desired of reducing cutaneous irritation. The remedy should be persevered in for weeks.

In co-operation with the above measures, the warm bath should be employed daily, and it will be still more effectual, if rendered demulcent by the addition of bran, flaxseed, or slippery elm.

In old and feeble individuals, the above course cannot be adopted. For these it is sometimes necessary to employ tonics, and a nutritious, though not stimulating diet, in order to correct the condition of the blood, the vitiation of which has probably contributed to the disease.

When the complaint has resisted the above measures, and certain local means to be mentioned directly, and the system has been sufficiently reduced, recourse may be had to alterative medicines such as experience has proved to be useful. Among these, the preparations of arsenic are, according to my own observation, incomparably the most efficacious. It is very seldom that the most obstinate case will refuse to yield to this remedy, if properly employed, and duly persevered in. I have known it to fail in no instance in which I have had an opportunity of doing it full justice. A case of fifteen years' duration, in which almost the whole surface was thickly covered with the eruption, yielded to the remedy. The patient began to improve soon after taking it, and recovered perfectly in about six months. I usually employ the Fowler's solution in the dose of from three to five drops three times a day, giving at the same time about a pint of the decoction of dulcamara daily, and employing warm mucilaginous baths, and, in very chronic cases, tar ointment, or ointment of iodide of sulphur, as a local remedy. Other preparations of arsenic have been used, among which are Pearson's solution, and arseniate of ammonia. The remedy should be suspended, if it occasion gastric uneasiness, œdema of the face, or muscular weakness, and resumed when these symptoms cease. To be successful it should be persevered in for a long time, even for several months, with occasional interruptions. The late Dr. Neligan, of Dublin, assured me that, in a considerable number of cases, he had succeeded in curing inveterate skin disease by varying the preparations of arsenic, having observed that, on ceasing to be favourably impressed by the preparation first employed, it would go on to a favourable issue on the substitution of another. He also told me that, in scaly disease, he had sometimes succeeded with iodine after failing with arsenic.

Another powerful remedy is tincture of cantharides. It has been found very effectual by M. Biett. From six to ten drops of the U. S. tincture, which is only about one-fourth as strong as the French, may be given twice a day, and gradually increased to forty or sixty drops, care being taken to suspend it should irritation of stomach or of the urinary passages result, and to resume it in smaller doses when this has subsided. It must be persevered in, with occasional intermissions, for months if necessary; but a cure, it is stated, may be expected from it in six or eight weeks. (*Cazenave* and *Schedel.*)

Neither tincture of cantharides nor arsenic should be administered in cases attended with inflammation of the stomach.

Numerous other remedies have been recommended, and most of them probably have some power. Among them are the officinal solution of potassa in the dose of twenty drops three times a day, carbonate of ammonia, corrosive sublimate with compound syrup of sarsaparilla, the antimonials, the preparations of iodine, sulphur, sulphuret of sodium, tar and turpentine, mezereon, burdock-root, rhus radicans, and galium aparine. (See *U. S. Dispensatory*, 10th to 12th ed.) M. Paul Dupuy has been remarkably successful with copaiba, giving at first about 30 grains daily, and increasing to 60 or 90 grains. The [illegible] in the morning fasting, and between meals. The [illegible] was from one to three months, according as pre[illegible] or had not been used. (*Ann. de Thérap.*, 1858, p. 75.) [illegible] has been specially recommended. Bateman says that the [illegible] injurious. In very obstinate cases, the practitioner would [illegible] to Donovan's solution.

[illegible] measures, it is best, in the early stages, to be content with [illegible] emollients, in the form of cataplasms, when the disease is suf[illegible], and of lotions consisting of warm water, milk and water, almond [illegible] emulsion, glycerin, &c., when it is more general. Exclusion of the [illegible] of collodion, or a solution of gutta-percha or gum-elastic in chlo[illegible] often be productive of advantage.

[illegible] the disease not yield, and should the constitutional measures mentioned as applicable to the early stages have been sufficiently tried, the practitioner may then employ tar ointment, which ought at first to be diluted with [illegible], and applied to a portion only of the diseased surface. Afterwards, if found [illegible] do good and no harm, it may be gradually increased in strength, and applied to the whole surface. So far as my observation has gone, this application is one of the most efficient in removing psoriatic eruptions.

The ointment of iodide of sulphur may also be used, having been employed very successfully. It may be made in the proportion of twelve or fifteen grains to an ounce of lard; and the quantity may be increased to thirty grains.

In certain obstinate cases of psoriasis palmaris, with painful warty indurations, Dr. Veiel, of Canstatt, has used successfully the solid chloride of zinc, applied, after the removal of the cuticle by vesication, in the form of a pencil cut to a point. (*Arch. Gén.*, Août, 1860, p. 218.)

Sulphur lotions, and sulphur baths have been favourably spoken of. The vapour bath is sometimes highly useful. Various irritant applications have been employed with asserted advantage. Such are lotions of corrosive sublimate, and ointments of nitrate of mercury, calomel, and the mercurial iodides. Blisters to the part have been used beneficially in some very obstinate cases. Some of these applications answer well in the local varieties of the disease; but I repeat that none have proved so effectual in my hands as tar ointment. In psoriasis of the scrotum, fumigations with sulphur and with cinnabar have been specially recommended. Cod-liver oil, thoroughly and constantly applied to the diseased surface, is said to have proved very serviceable.

Whatever course of treatment may be adopted, it is all-important that the causes of the disease should be avoided; and consequently that the patient should relinquish all habits of living, or particular pursuits of business, which may be thought to have been instrumental in producing it.

II. LEPRA, OR LEPROSY.

Lepra is a Greek term, which was wrongly applied by the earlier modern writers to different cutaneous diseases, but was restored by Willan to its original signification, and is now generally employed to designate a scaly affection, characterized by circular patches, depressed in their centre.

The disease may occur in any part of the body, but usually commences upon the extremities, whence it extends to the trunk, and sometimes to the head.

Symptoms.—The eruption begins with minute solid eminences of a reddish colour, smooth at first, but, in the course of a day or two, covering themselves with extremely delicate scales. These occur quite distinctly, and at considerable distances. Each one is quickly surrounded with others of a similar kind, thus forming a small circular patch, singularly regular in shape. The patches are covered with glistening, tough, grayish or pale-yellowish, translucent scales, and have a red slightly elevated margin, which gives them the appearance of being somewhat depressed in the centre. The scales fall and are renewed, but accumulate and overlie each other upon the border, where they sometimes form a prominent incrustation, of a whitish colour. When the scales are removed, the surface is red, shining, and in this stage of the disease quite smooth. These circular patches enlarge, often with considerable rapidity; still preserving their regular form, with the red prominent margin; while the central portions frequently return to the healthy state, so that the eruption presents the appearance of a ring of greater or less width surrounding a portion of sound skin.

The size which the patches may attain is not definite. Often about an inch in diameter, they sometimes greatly exceed these dimensions, and in some cases reach even a foot or more. But, in thus expanding, neighbouring patches often coalesce, lose in some measure their distinctive shape, and form large patches, in which, however, the remains of the circular outline may still be seen. This is especially apt to happen in the vicinity of the joints. When the scales are removed from these old patches, instead of the smooth surface originally presented, there are often deep lines or furrows, intersecting each other, and giving to the part a reticular appearance.

It has been stated that the eruption usually first appears on the limbs. It especially affects the parts in which the bones are most thinly covered, and like psoriasis shows a peculiar predilection for the neighbourhood of the joints, as the knees and elbows. It most frequently appears on both legs or both arms at the same time. From the limbs it spreads to the trunk, not unfrequently reaches the scalp, and sometimes covers irregularly almost the whole surface of the body, sparing only the face and hands. Even these do not always escape; though the face is very seldom affected, unless upon the forehead and temples, near the insertion of the hair.

The disease is liable to some diversities. In some instances, especially in children, the patches never exceed a few lines in diameter, appear only or chiefly on the extremities, and are covered with whiter scales than in the common variety. In this form, the affection was denominated *Lepra alphoides* by Willan, while to the ordinary form he gave the name of *Lepra vulgaris*.

Cazenave and Schedel describe a variety of the eruption, characterised by one, two, or three large circles upon the trunk, especially on the back, a foot or more in diameter, consisting of an elevated margin of a few lines in breadth, wholly without scales, bordered within and without by a fringe of redness, and enclosing a central portion of perfectly sound skin. The nature of the disease was shown by a simultaneous appearance upon the limbs of a few of the characteristic patches.

Some rare instances of the disease have been noticed with the patches of a dark-livid colour. These were denominated by Willan *Lepra nigricans*.

A scaly affection is sometimes met with, consisting of circular patches less than an inch in diameter, upon which the scales, instead of disappearing from the centre as in ordinary lepra, seem to accumulate one upon another, the topmost one, which is smallest, being pushed upward by the larger produced beneath, so as to form a very low cone with a relatively very broad base; and many of the patches thus formed, clustering together, cover sometimes a considerable extent of surface. This eruption might be considered as a form of either lepra or psoriasis; but its regular circular shape may perhaps be considered as ranking it most appropriately with the former. If specially designated, it should receive the name of *Lepra prominens*.

The duration of lepra is indefinite. It occasionally disappears spontaneously; but is very apt to return, and, if not interrupted by treatment, will frequently continue for many years. The general health is, during all this time, scarcely disturbed; and the only inconvenience usually experienced is an itching when the patient is warm in bed, or heated by violent exercise. Bateman states that the itching is sometimes excited by certain states of the weather. In bad and inveterate cases, there is occasionally much soreness, stiffness, and pain upon motion; and the joints have become, in some instances, so stiffened by the disease of the skin as to prevent walking, and to confine the patient to his bed.

When recovery takes place, it begins in the centre of the patches, and gradually extends towards the circumference, which is penetrated here and there, and broken into fragments, before it entirely disappears.

Causes.—These, so far as known, are precisely the same as those of psoriasis, and need not, therefore, be repeated here. The disease occurs more frequently in adults than in children, in men than in women, in autumn than in winter. It is sometimes hereditary, and never contagious.

Diagnosis.—From *Psoriasis guttata* the disease is distinguished by the smaller patches of that affection, their less regularly circular form, and their want of depression in the centre. Even when the patches of lepra coalesce, there are sections of circles to show its peculiar character, and almost always, in some part or another of the body, circles may be seen which have retained their integrity.

Porrigo scutulata presents some resemblance to lepra, when the patches have been deprived of their crusts, and a red circle only remains; but the characteristic eruption of the complaint will not long be absent; and the destruction of the hair, in porrigo, is another diagnostic sign.

Syphilitic eruptions sometimes assume the circular shape, but, on close inspection, it will be seen that the ring is formed by little tubercules arranged side by side, and that, if there be any scales, they are much smaller than those of lepra, and not continuous, covering as they do only a small portion of each of the minute elevations. Besides, the concomitants of the syphilitic affection are sufficient to distinguish it.

Prognosis.—Lepra is never dangerous, but often extremely obstinate; and when relieved is very apt to return. It may, however, almost always be ameliorated, and often permanently cured, if the patient can be induced to avoid the causes, and adhere to the regimen and mode of life prescribed.

Treatment.—This is exactly the same as that of psoriasis, to which, therefore, the reader is referred.

III. PITYRIASIS.

Pityriasis (from πίτυρον, bran) is a title generally given to a superficial inflammation of the skin, attended with a continued exfoliation of minute bran-like scales, which are renewed as fast as they are thrown off. This definition is extended by Rayer, so as to embrace superficial inflammation with *foliaceous*, as well as *furfuraceous* desquamation, occurring in spots or patches; and there are certainly cases of cutaneous disease, which cannot be properly classified, unless this extension, or a similar one for psoriasis, be admitted

The disease is sometimes confined to the head, where it occupies especially the parts covered with hair; but it may occur also upon any portion of the surface; and, in some instances, spreads extensively over the body, disappearing in one part when it fixes on another.

Symptoms.—In some cases, the disease makes its appearance without any observable preceding redness, the first phenomenon presented being surfaces of variable extent, covered with minute, dry, whitish scales, partially separated from the skin, often arranged in an imbricated manner, and easily detached in great numbers by scratching or rubbing the part. Sometimes the affected surface is covered by a uniform incrustation, divided into innumerable minute sections, which may be separated in the form of bran-like particles. Not unfrequently several of these minute scales may thus be successively detached by the nail from the same spot, before the reddened speck of skin is exhibited which supplies them. This form of the disease is apt to occur in the head, where it affects chiefly the parts covered with hair, and especially the scalp. In this situation it was denominated *Pityriasis capitis* by Willan.

In most instances, when the disease appears on other parts of the body, it begins in the form of small red erythematous spots or blotches, which ultimately enlarge into patches of various shape and dimensions. The redness is sometimes attended with swelling of the subcutaneous areolar tissue. In a few days the cuticle exfoliates, generally in the form of white furfuraceous scales, so as to give the surface an appearance as if covered with meal or bran. When these are separated, their place is rapidly supplied with others, and the quantity produced increases with the duration of the complaint; so that, in some old cases, they may be detached by the nails almost in clouds. But not unfrequently, instead of these bran-like scales, portions of cuticle are detached, varying from two or three lines to nearly an inch in diameter; and these also are renewed as fast as removed. The affected surface is usually dry and rough to the touch, but occasionally soft from a kind of oily exudation. (*Cazenave* and *Schedel.*) When the scales are separated, the skin is quite red, and sometimes sore and slightly painful. According to Rayer, when the patient scratches the part severely, a serous yellowish fluid exudes from the denuded surface, sometimes so abundantly as to soak the clothing, and to give to the affection a certain resemblance to eczema. The form of the disease described in this paragraph belongs to the *Pityriasis rubra* of Willan.

Rayer states that the disease is less severe, and the exfoliation finer, on the inner than the outer surfaces of the limbs, and on the breast than the back. About the olecranon and patella, and in the palms of the hands and soles of the feet, broader and thicker laminæ are separated than elsewhere. On the scalp, and in the face, it is generally powdery. A brief notice of the complaint in different positions will close the account of the symptoms.

In the *scalp* it occurs frequently in very young infants, and occasionally also in adults and old people. It is in this situation commonly called dandriff. About the forehead and temples a mealy scurf may generally be seen, and, by slight scratching with a comb, the hair may be filled with the minute scales. But, sometimes, upon the scalp the epidermis is detached in scales of considerable size. In some instances, along with the production of scales, there is an exudation of an adhesive fluid, which agglutinates the hair with the scales, and forms a complete covering for the head, which has been compared to a cap of asbestos. Upon removing this, the surface is seen to be vividly red in numerous points. (*Rayer.*) The *eyebrows* are sometimes alone affected. Occasionally also the disease is confined to the *lips*, the red surface of which throws off a constant succession of translucent laminæ, which sometimes leave the surface beneath them redder than in health, and somewhat painful. This affection is usually worse in winter than in summer. Though not serious, it is very troublesome. I have known it to last for many years. The *palms* of the hands and *soles* of the feet are also liable to be affected, presenting, instead of the solid elevations of psoriasis, simply red spots, which gradually spread, and constantly detach laminæ of thickened and yellowish epidermis.

All the varieties of pityriasis are attended with itching, tingling, or pricking sensations, which are sometimes very intense, and cause the patient to scratch severely, so as to increase the inflammation, and, as before stated, produce a serous exudation. There is seldom any constitutional disturbance. Occasionally, however, the disease appears to attack the mucous membrane, as well as the skin, producing the ordinary phenomena of gastro-enteric inflammation or irritation.

Under the name of *Pityriasis versicolor*, Willan described an affection, which, though it has some of the characters of the scaly eruptions, is in other respects peculiar, and has an entirely different origin, being associated with a microscopic fungus, now generally admitted to be the cause of it. I shall treat of it under the head of the parasitic cutaneous affections.

Causes.—The causes of pityriasis are obscure. As it occurs upon the scalp of infants and old men, it has been ascribed to the scantiness of the hair, affording an insufficient protection to the surface. Upon the chin, it is supposed sometimes to result from shaving. Among the exciting causes have also been enumerated the heat of the sun, exposure to the fire, vicissitudes of temperature, the influence of hot climates, and the use of spices and other stimulating condiments, of alcoholic drinks, and certain articles of diet, as mushrooms. The association between these supposed agencies and the disease has probably been, in general, less that of cause and effect than of mere coincidence. The disease occurs at all times of life, and in both sexes. Rayer thinks it is sometimes connected with amenorrhœa.

Diagnosis.—There is in various cutaneous affections more or less of a furfuraceous exfoliation, like that of pityriasis; but it may almost always be distinguished by the presence of some peculiarity of those eruptions, such as the appearance of pimples, vesicles, or pustules, or the shape of the diseased surface. Psoriasis and lepra are distinguished by the shape of their patches, and the elevation of the skin in the affected parts, not to speak of the fissures and indentations which attend inveterate cases of these diseases.

Prognosis.—Though often easily cured, pityriasis is liable to return, and, in some cases, is very obstinate. It may even be dangerous if associated with gastro-intestinal irritation, though such cases are very rare.

Treatment.—In the milder forms of the disease little general treatment is required. To keep the bowels open with saline laxatives, to obviate acidity by the alkaline carbonates, and to avoid stimulating articles of diet, are all that is necessary in some cases. Sometimes, when there is considerable cutaneous inflammation, and the patient is vigorous, it may be proper to take blood from the arm; and the saline cathartics may be employed more freely. The antimonials may here also be useful. In cases attended with debility, it may, on the contrary, be necessary to give tonics. The alterative vegetable diaphoretics, as represented by the compound decoction or syrup of sarsaparilla, may be used, and Bateman states that he has employed the tincture of white hellebore advantageously in small doses. In very obstinate cases, recourse may be had to the arsenical preparations, and other alterative treatment, as recommended in psoriasis. Baths are probably more efficient than internal remedies. In inflammatory cases, the warm or mucilaginous bath should be preferred; in others, the vapour, alkaline, or sulphur bath.

As local measures, it will often be sufficient, as the disease occurs in the heads of children, to keep the part perfectly clean by frequent ablutions. Should it refuse to yield, spirituous or alkaline lotions may be employed; and, these failing, recourse may be had to unctuous preparations of alum, acetate of lead, sulphate of zinc, ammoniated mercury, &c. When there is no inflammation, I have found the tar ointment very useful. It often excites a little inflammation, upon the subsidence of which, the tendency to exfoliation diminishes or disappears. Solution of chloride of lime has been recommended; and the vapour douche is a favourite remedy with many. In the affection of the lips, the surface should be protected against the drying effects of the winter air, by some simple unirritating lip-salve; and the ointments of subacetate of lead, oxide of zinc, and calamine may be tried with a view to a remedial impression.

IV. ICHTHYOSIS.

Syn.—Fish-skin Disease.

THIS affection is characterized by a hardened, thickened, rough, almost horny state of the cuticle, which breaks into small irregular scale-like pieces, apparently bounded by the natural furrows of the skin, little disposed to exfoliate, but soon replaced by others of a similar character when removed, and quite unattended with inflammation.

The disease may be confined to a particular portion of the body, or may occupy at the same time almost the whole surface. It is most frequently congenital, but sometimes acquired.

In the congenital cases, the child is not born with the disease fully developed. The skin is thick, harsh, and of a dirty colour; but the epidermis retains its integrity. In a few months, however, the surface assumes the condition which is afterwards to continue during life. In the mildest form, there is merely a dry state of the skin, with the appearance of small furfuraceous scales, as in the desquamation which follows certain exanthematous eruptions. When the disease is of a severer character, the thickened epidermis breaks into scales of various shapes and sizes, often representing the natural cuticular lozenges, but sometimes embracing several of them in one. These little sections of the cuticle are dry, hard, occasionally shining and pearly, somewhat elevated like warts, and often surrounded by a blackish circle. They are generally detached for a greater or less extent of their circumference. In certain parts of the body they appear sometimes to be imbricated. They give to the skin a roughness to the fingers, which has been compared to that of a file, or of the roughest shagreen, or of the surface of a fish. The true skin, upon their removal, exhibits no redness or other sign of inflammation; and it is only some of the larger scales, which, adhering rather firmly, occasion any uneasiness when they are detached. The furrows of the corium are somewhat deeper than in health, and the follicles are often greatly developed. (*Rayer.*) There is another variety, in which minute portions of the epidermis are separately hypertrophied, and project sometimes considerably above their base. The colour is usually dark. I have seen the case of a boy in England, in whom almost the whole surface of the body was covered with little slender, hard, movable prominences, about a line in length, closely crowded together, of a dark-brown somewhat olive hue, and in the bend of the elbow as fine as hair, so that, when the arm was extended, it had the appearance of the pile of velvet, or the short fur of an animal. The boy was at the time about fourteen years old, was quite healthy, and exhibited himself as a show. He had been affected with the complaint from early infancy.

Though the disease may affect, more or less, almost the whole surface, certain parts are less liable to it than others. Among these are the surfaces which perspire freely, as the palms and soles, and where the skin is most delicate, as the groin and axilla, the inner surface of the limbs, and the face, especially the eyelids. On the contrary, the outer parts of the limbs, the convex surface of the knee and elbow, the posterior and upper portion of the chest and the neck, having a thicker cuticle, are most liable to be severely affected.

The disease is attended with no constitutional derangement; and the general health is often remarkably good. Nor does the patient suffer the least itching or pain. The skin is very dry; and it might be supposed that injury must result from the suppression of the perspiration; but either the office of the skin is vicariously supplied by other emunctories, or the excessive secretion which sometimes takes place from certain parts, as the palms and the soles, compensate for the general deficiency.

Occasionally it appears that ichthyosis is favourably modified by the supervention of other diseases attended with inflammation of the skin; but the effect is temporary. In some instances, the diseased epidermis is said to exfoliate in the summer; but the same condition returns with the cold weather.

Belonging to the same class of cuticular hypertrophy, is the affection characterized by the development, on the skin, of horn-like excrescences, consisting of layers of hardened epidermis, which have sometimes, though erroneously, been called horns. Of a similar nature was the noted porcupine disease, which affected several members of the same family in England. Bateman calls this affection *I. cornea*, while he designates common ichthyosis as *I. simplex*.

Causes.—The disease is sometimes hereditary, and sometimes occurs in several children of the same parents without having previously existed in the family. In the latter case, it has been attributed by some to impressions made on the mind of the mother during pregnancy. It is said to occur more frequently than usual among persons who live near certain parts of the sea-coast, where they are exposed to dampness and offensive exhalations, and eat tainted fish. But all this is very problematical. Both sexes are liable to the complaint; but of the persons who applied at the Hospital of St. Louis in Paris, under the charge of M. Biett, only one-twentieth were women.

Diagnosis.—There is seldom any difficulty in distinguishing ichthyosis. Some cases attended with a furfuraceous exfoliation might possibly be confounded with pityriasis; but the disposition of the latter affection to occur in patches, the itching and other unpleasant sensations which attend it, and the existence of some inflammation of the skin, however slight in certain cases, are sufficiently diagnostic.

Prognosis.—The disease is exceedingly obstinate. When congenital, it may be considered as incurable. The acquired variety is sometimes cured, but generally resists treatment long, and often altogether; and, when completely developed, is apt to continue, in a greater or less degree, during life.

Treatment.—This, in the congenital cases, must be purely palliative; and consists in the frequent use of the warm or vapour bath so as to soften the diseased epidermis, and to enable the patient to remove it with the fingers. Frictions to the surface by means of a piece of flannel may be conjoined with the bath. This plan was recommended by Willan, though he states that the layer of cuticle which remained was harsh and dry, and the skin did not recover its softness. Bateman knew an instance in which the skin was cleared by sulphurous bathing and frictions; but it did not regain a healthy condition; and the scales returned.

Different remedies have been proposed for the affection when accidental. Willan placed some confidence in the internal use of tar; and several cases of cure by that remedy are reported, among others, one by Dr. Elliotson, who conjoined with the internal remedy the free use of oleaginous applications externally. But neither Biett nor Rayer met with any success with the remedy. It must be given largely and long. A scruple should be given at first three times a day, in pills, and the quantity gradually increased, until the whole amount each day shall reach half an ounce. Bateman effected a cure in one case with Fowler's solution, though he failed in two others. But local treatment is probably more efficacious than constitutional. I should, in such a case, use the tar ointment liberally and perseveringly, conjoined with emollient, warm, hot, or vapour baths. Biett cured a case of local ichthyosis by repeated blistering. Mr. Plumbe cured two cases of the disease in the leg, by strapping the part tightly with adhesive plaster, and keeping a muslin roller upon the limb constantly wet with cold water. The strips were renewed every fourth or fifth day, and each time brought away with them much of the diseased cuticle. A cure is also recorded by Mr. Colson, effected by the use, first of a wash of corrosive sublimate, and afterwards of a liniment made with half an ounce of nitrate of mercury and an ounce of olive oil, applied three times daily. (Rayer on *Diseases of the Skin*, Am. ed., p. 850.) Dr. Banks, of Dublin, reports a cure effected by the sedulous use of cod-liver oil internally and externally, continued for three months. A vapour bath was applied every night, upon coming out of which, the patient, a girl of thirteen years, was well rubbed over the whole body with the oil, flannel being constantly worn next the skin. (*Dub. Quart. Journ. of Med. Sci.*, Aug. 1851, p. 81.) Dr. O'Connor, of London, has cured two cases by the external use of the same oil. (See *Bost. Med. and Surg. Journ.*, liv. 218.)

Article VI.

TUBERCULATED DISEASES.

I. ELEPHANTIASIS OF THE GREEKS.

Syn.—*Lepra Tuberculosa.*—*Leontiasis.*—*Satyriasis.*

Two entirely distinct diseases are known by the name of elephantiasis; one essentially a tuberculated affection of the skin; the other a hypertrophied and altered condition of the subcutaneous tissue. The former is the *elephantiasis* of the Greek writers, the latter that of the Arabian writers; and they are thus distinguished in most modern works. As they are both exceedingly rare in this country, a very brief description of them will be sufficient. Not belonging to the tuberculated affections, the elephantiasis of the Arabs will be noticed in a subsequent article.

The Greek elephantiasis is characterized by an eruption of irregular tumours, of a size from that of a pea to that of a walnut or larger, somewhat soft, smooth, shining, and of a colour at first dusky-red or livid, but in the end yellowish-brown or like bronze. These tumours are usually preceded by patches of an erythematous appearance in white persons, but darker than the natural colour of the skin in the blacks. Sometimes they are developed rapidly, sometimes very slowly. The skin between the tumours is also thickened and discoloured, the subcutaneous tissue often swells, and the part affected becomes greatly deformed. In this state of development, the tumours are often very tender, so that the effect of pressure upon them has been compared to that produced by unexpectedly hitting the nerve at the elbow against hard objects.

The disease may occur upon any part of the body, and sometimes extends over almost the whole surface. The part most frequently affected is the face. When this is fully occupied by the disease, it presents a revolting and even hideous aspect. Knotty, irregular prominences are exhibited here and there over its surface, separated often by deep furrows; the skin is much hypertrophied and rugose upon the cheeks, forehead, chin, &c.; the lips, ears, and alæ of the nose are enormously thickened; the nostrils are distended, and the brows overhanging; the eyebrows, eyelashes, and beard have fallen off; and the whole face is enlarged, uneven, oily, and of a peculiar dusky livid hue. The face of a boy, whom I have seen with the disease, was that of advanced life; and it was difficult to look at the child and not believe that it was a little old man who was before me. The countenance has been compared by writers to that of a lion or other beast; and hence the designation of leontiasis. The disease extends at length to the mucous membranes, and tubercules are often developed in the mouth, fauces, and larynx, and the eyes become inflamed.

Sometimes, instead of the whole face, only a single feature is affected, as the nose or ears, which become enormously enlarged.

When the lower extremities are the seat of the eruption, it is apt to appear especially on the inferior portion of the thigh and about the ankle; but, whatever part it attacks, exhibits the same coarse, exaggerated, unequal, and revolting aspect, with the prominences, furrows, and livid or bronze hue characteristic of the disease.

In the advanced stages, there is usually a great diminution or total loss of special sensibility. The parts affected become insensible or nearly so to impressions; the smell and taste are impaired or lost; the sight and hearing also are affected; the voice is husky or extinguished. The moral qualities and powers are equally changed. The patient is careless, indifferent, or dejected, and loses all mental energy. A very common opinion has been that the sexual propensities are morbidly increased; but this is denied by many, who have observed exactly the opposite result. Perhaps the condition of the patient may be different, in this respect, in the early and advanced stages.

For a long time, the general organic functions are not materially impaired; and the patient retains a tolerable degree of health, with the exception of his local disease, for many years. In some instances, however, gastro-intestinal inflammation is developed; and this appears to be generally the case, in a greater or less degree, in the advanced stages. The local affection now also undergoes a change. Inflammation is developed in the tumours, which ulcerate, exude an ichorous matter, and form black scabs, or open running sores. Sometimes the morbid tendency extends also to the deeper structures; the bones become softened and carious; the soft tissues slough; the nose sometimes falls in; and it is said that the smaller joints occasionally separate by mortification. The progress of the tumours is not uniformly destructive. Sometimes they appear to undergo absorption; and the ulcers in which they are apt to terminate sometimes heal; but, while an apparent amelioration takes place in one part, the disease is advancing in another; and death comes at last as a relief to the patient and all those around him.

There appear to be two varieties of the affection, which, though frequently mingled, are frequently also distinct; the *tuberculated* as above described, and the *anæsthetic*. In the latter, in place of tumours, vesicles appear on the extremities, succeeding each other as in pemphigus, and after breaking leave sores, which cover themselves with white scabs. The limbs, at first, perhaps, excessively sensitive, gradually lose their sensibility, and become stiff and inflexible, having sometimes a purplish and glazed appearance. The soft parts swell, suppuration takes place, and the small bones of the hands or feet, having been long diseased, are now separated and thrown off; and the patient at length perishes, sometimes after a period of fifteen or twenty years of varied suffering, and progressive depravation of health with occasional remissions. The tuberculated variety is of shorter duration, seldom continuing longer than twelve years. (See *Lond. Med. Times and Gaz.*, v. 549, and vii. 446 and 470.)

Examination after death, besides the obvious disease of the skin, reveals signs of gastro-intestinal inflammation, and often also tuberculous disease in the lungs and mesentery, and a soft and spongy state of the bones. The mucous membrane is everywhere of the same bronze hue as the skin; the peculiar tubercules of the disease are traced into the larynx and œsophagus, and various parts of the chest and abdomen; the mucous membrane of the stomach is found softened, and thinner than in health; that of the bowels, softened, thickened, and ulcerated; and the glands of Peyer are occasionally diseased. The tumours are formed by the deposition of a peculiar matter, which has also been observed surrounding and infiltrating the nerves, and subsequently the nervous centres, thus explaining the anæsthetic character of many of the cases. The matter deposited is whitish or yellowish, with a disposition to be softened and thrown off, analogous in this respect to tubercle, and differing from cancer in the absence of blood-vessels, and in the mode of increase, which is rather by further deposition than by growth.

Causes.—Little is known with certainty of the etiology of the disease. It has been ascribed to contagion, but on insufficient grounds. Some have supposed it to be dependent upon syphilitic contamination, but altogether without proof. There is little doubt that it is often transmitted by inheritance. It appears sometimes to have been epidemic in certain parts of Europe. It is endemic in hot latitudes all over the globe; but it exists also in high northern latitudes, being prevalent in certain parts of Norway, in one of the provinces of Sweden (*Arch. Gén.*, *5e sér.*, i. 515), in Iceland (*Ibid.*, Fév. 1857, p. 245), and, within very narrow limits, in the British province of New Brunswick, among the descendants of the French Acadians. (*Bost. Med. and Surg. Journ.*, xlvi. 29 and 169.) A residence in low marshy neighbourhoods, miserable living and uncleanly habits, and a diet of salt provisions, especially of pork and fish, have been accused of producing it; but these causes often exist where the disease is unknown. It is thought to have been occasionally induced, in the predisposed, by the intemperate use of alcoholic drinks, violent emotions, and menstrual derangements. No age and neither sex is exempt; but men are probably more frequently attacked than women, and the young than the old.*

Prognosis.—This is always a very serious, and generally, sooner or later, a fatal disease. In some instances, however, it undergoes a favourable change; either the tumours disappearing by resolution, or the ulcers in which they terminate healing under the scabs, and leaving permanent scars behind them. Some hope of a favourable issue may be indulged, when the patient is young and vigorous, and the disease in its early stage, and not extensive.

Treatment.—The great liability to gastro-enteric inflammation in this disease renders the internal employment of remedies, fitted to produce a favourable effect upon it, somewhat hazardous. The substances which have been found most efficient, in the modification of the cutaneous affection, are those which exercise some irritant influence on the alimentary canal. The calotropis gigantea (*madar* or *mudar*) is said to have been usefully employed in the

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* *Morbid Anatomy.*—For an interesting account of elephantiasis in India (leprosy, as the disease is there denominated) by Dr. H. V. Carter, Assistant Surgeon in the India Army, and teacher of anatomy in Bombay Med. College, see an article in the *B. & F. Medico-chir. Rev.*, Jan. 1863, p. 183. Among the most interesting facts stated by Dr. Carter, are those concerning the morbid anatomy of the disease, of which the following is an abstract. With the exception of pulmonary congestion or adhesion, and sometimes dysenteric ulceration, the brain and spinal cord, the sympathetic ganglia, the alimentary canal, the lungs, heart, liver, spleen, pancreas, supra-renal capsules, and the lymphatic glands generally were found healthy in all the cases examined. The muscles were often pale, and the blood loosely coagulated. The chief signs of disease were in the kidneys and nerves. The former were greatly enlarged, smooth, and pale, with evidences on section of a whitish deposit. In two cases examined, there were marks of fatty degeneration. The nerves as they proceeded from the spine, and those forming the various plexuses of the neck, abdomen, and pelvis, were healthy; but the trunks distributed to the affected parts were invariably diseased; being enlarged, altered in colour, and of a firm consistence, but without signs of inflammation, either of the nerve-structure or of the neurilemma. The proper nervous cords are the seat of the morbid change; the tubules of which they are formed being, by the development among them of a nucleated tissue, separated and compressed, and ultimately so much altered as to be wholly destroyed. These phenomena are observed only in the cutaneous nerves, and in these only after they have emerged from beneath the fasciæ and muscles which may have overlain them in their earlier course. Moreover, the microscope determines that in a nerve-fasciculus, only some of the tubuli may be affected. Whether the disease of the nerves or that of the skin is the original affection remains to be determined; but it seems to have been demonstrated, beyond doubt, by Dr. Carter, that the two are essentially connected. (*Note to the sixth edition.*)

East Indies. Similar effects might be expected from the different species of asclepias growing in this country. Hydrocotyle Asiatica, a plant of South Africa and the E. Indies, has been strongly recommended. (See *U. S. Dispensatory*, 12th ed., p. 1529.) Another E. India plant, the gynocardia odorata or chaulmoogra, has been used with asserted advantage by Dr. Monat, in the East. He gave the seeds in the dose of six grains three times a day. (*Ibid.*, p. 1525.) The alterative diaphoretics, such as sarsaparilla, mezereon, and sassafras, are thought to have been sometimes useful, conjoined or not with the antimonials. Iodide of potassium, or other preparation of iodine, should always be employed, if not forbidden by the state of the stomach and bowels. Dr. Danielson, of Bergen, in Norway, has found more advantage from this medicine, and from iodide of iron, than from any others, preferring the latter in the anæsthetic cases. Biett recommends the employment of tincture of iodine and the preparations of arsenic. Mercury has been tried without benefit. Perhaps cod-liver oil might be serviceable. When the alimentary canal is inflamed, a soothing treatment should be employed, consisting of demulcent drinks, light, easily digestible food, and the use of opiates. Nitrate of silver with opium might be useful in these cases.

Externally, the vapour douche, the vapour bath, rubefacient liniments, frictions with ointment of iodide of potassium, repeated blistering, and cauterization have been recommended.

Perhaps the most effective measure, in the earliest stage of the disease, would be to remove the patient from those influences of climate, food, and general mode of living, under which it originated.

Since the publication of the fifth edition of this work, three remarkable instances of cure of this obstinate disease have been recorded by Mr. Wm. Colles, Medical Officer at the Civil Station of Pubna, in Bengal. The treatment consisted in the application to different portions of the diseased skin, successively, *first*, of an ointment made by mixing from 10 to 30 grains of arsenious acid with an ounce of simple cerate, repeated night and morning, and continued for two or three weeks, or until an eruption was produced similar to that of tartar emetic; and *afterwards*, of an ointment composed of 15 grains of biniodide of mercury and an ounce of simple cerate, which caused copious vesication by the next day, followed, on the subsidence of the inflammation and consequent desquamation, by a return of the skin to very nearly its natural condition. Upon a repetition of this treatment, when required, and its successive application to all the diseased parts, the health was perfectly restored; and, as no return of the affection took place, it was inferred that the absorbed arsenic had entirely removed the constitutional disorder. (*Lancet*, April, 1864, p. 408.)

II. LUPUS.

This is a chronic disease, manifested usually by dull-red or livid indolent tubercules, having a tendency either to destroy, or deeply alter the neighbouring tissues, with or without ulceration, and ending generally in indelible cicatrices. It was known to the ancients, and in its ulcerous form is the *noli me tangere* of surgical writers. There are two prominent varieties of it, distinguished by the titles of *Lupus exedens* and *Lupus non exedens*, which deserve separate notice. Cazenave has described a third variety, in which the skin is diseased in patches, without elevation, and which has no claim, therefore, to be ranked with the tubercules. As it is attended with redness of the skin, like erythema, it has been proposed to denominate it *erythematous lupus*.

The disease usually attacks the face, especially the nose and lips, but is sometimes met with elsewhere, and has been especially noticed in the vicinity of the anus, and the vulva in women. It is happily a rare affection.

Symptoms, Course, &c.—Lupus usually commences with one or more tubercules, circular or oval, about two lines in diameter, of a dull-red colour, somewhat translucent, soft or hard, and seated in the superficial portion of the skin. They usually remain stationary for some time, but at length increase in numbers and size, and take on new characters.

In the ulcerous variety (*Lupus exedens*), they either spread from a central point, producing a superficial ulceration of the skin, or sink deeply, causing considerable destruction of the parts beneath and about them. In the former case, the tubercule becomes inflamed and forms a scab on the top, upon the removal of which an ulcerated surface appears, which soon covers itself with another scab; additional tubercules arise around the first, and undergo similar changes; and the affection thus spreads sometimes over a considerable extent of skin; the central portion cicatrizing as the circumference extends. Not unfrequently the ulceration returns again upon the cicatrized portion; and this course may be repeated more than once. When at length the surface approaches health, it is either rough, appearing as if sprinkled over with minute dull-red tubercules, or covers itself with thin scales, ending in an indelible white scar. Instead of pursuing this superficial course, the disease frequently sinks more deeply. Underneath the first scab an ulcer is formed, which deepens and spreads, and, as scabs are successively formed and thrown off, appears to have extended further and further, until at length much destruction is produced, not only of the soft parts, but also of the cartilages in its vicinity. Thus, beginning on the nose, it may to a greater or less extent destroy that feature, which is reddened and swollen, may spread thence to the adjacent parts of the cheek, and may even involve the palate and the gums. The ulcer of lupus has thick red edges, with an irregular surface, covered with patches of white lymph, or studded with fungous granulations, and exudes a fetid, ichorous, puruloid matter, often in considerable quantities. It generally, however, heals at last, leaving an unsightly cicatrix, remarkable for its white corrugated bands. There can be no doubt that ulcerated lupus has often been mistaken for cancer, and that the credit, obtained by some empirical preparations in the cure of the latter affection, has resulted from their successful use in the former.

Mr. Lawrence has described an obstinate ulcer of the nose, lip, cheek, &c., which he considers to be lupus, though not produced by tubercules. It is characterized by a mammillated surface, and an excessive indolence and obstinacy, and leaves behind it a smooth cicatrix, free from the white bands which are so striking a feature in the scars of ordinary lupus. (*Med. Times and Gaz.*, Nov. 1856, p. 530.)

In the variety without ulceration (*Lupus non exedens*), the tubercules are softer than in the preceding, are but slightly prominent, and often form patches of considerable extent, and usually of a circular or annular shape. The intervening skin and areolar tissue swell, and at length, in some instances, the entire surface becomes swollen, exhibiting here and there dull-red points, which are the summits of the embedded tubercules. The lips in these cases are much enlarged, the nostrils closed with tumefaction, the eyelids everted, and the whole countenance of a hideous aspect.

Of the *erythematous lupus*, described by Cazenave, three prominent forms have been noticed. 1. In the simplest form, it appears on the forehead or cheek as a circular patch of redness, about as large as half a dollar, somewhat raised above the sound surface, gradually extending by its circumference, without itching or pain unless sometimes when pressed, and at length subsiding, and leaving behind, without other change, a superficial scar like that of a burn. 2. In a second form, which is more frequent, the redness shows itself usually at first on the end of the nose, and subsides and reappears, perhaps several times, before becoming fixed. There is some swelling, but little or no pain except on exposure to sudden changes of temperature, or on the occasion of some intemperate indulgence, when a smarting sensation is experienced. At length the redness disappears, a superficial exfoliation takes place, and the skin is left thin, smooth, and shining. 3. The third form is marked by a more rapid exfoliation, one lamina after another of the skin separating, without ulceration, until the tissue is nearly or quite destroyed, when the morbid tendency ceases, a cicatrix being left behind. (*Lond. Med. Gaz.*, N. S., xiii. 858.) There is reason to believe that one or more of these varieties of the *erythematous lupus* of Cazenave is identical with the affection already described under the name of *Acne atrophica*, which is believed to depend on atrophy of the sebaceous follicles, following an over-exertion of these little glands. (See *note*, page 473.)

In all the varieties, indelible marks of the disease are left behind, and the cicatrix is destitute of the natural sensibility of the skin.

The progress of lupus, though sometimes rapid, is usually slow, and the sufferings of the patient less than might be imagined; the sensibility in the parts affected being diminished from the first. The complaint sometimes continues for years, sometimes for life; but is seldom if ever fatal. It is often obstinate under treatment, and is generally so in proportion to its duration.

Causes.—These are not well known; but there is reason to believe that a scrofulous habit, and intemperance in drinking, predispose to the disease. It attacks the young preferably, and is most common between the ages of puberty and full maturity. It occurs in infants, but seldom after forty. Both sexes are equally liable. It is not contagious. Cazenave states that the erythematous variety is most frequently brought on by cold.

Treatment.—The general treatment is precisely that adapted to scrofula (see *vol.* i. *page* 870); the most prominent remedies being cod-liver oil, and the preparations of iodine. The arsenicals and mercurials have also been used, but with more doubtful results. Nevertheless, Rayer recommends red iodide of mercury as the most efficacious remedy, and Erasmus Wilson has obtained the best results from a prolonged use of Donovan's solution.

More is thought to depend on local measures. For the non-ulcerous form of the disease, Mr. Wilson prefers the acetum cantharidis to any other application. Both for this and the ulcerous form, the appropriate remedies are escharotics, of which many have been employed. Among them may be mentioned the mineral acids, chloride of zinc, chloride of gold, red iodide of mercury, and arsenious acid or some other preparation of arsenic. These should be more or less diluted when applied. Nitrate of silver or sulphate of copper may be employed to favour the healing of the ulcers. Cazenave uses biniodide of mercury, and sometimes Dippel's animal oil, which are his only local measures. He mixes equal parts of the biniodide and a mixture of lard and almond oil. The ointment produces much redness and pain, and, if the cuticle remains, vesication and pustulation, followed by scabs. If the cuticle is wanting, a thick albuminoid secretion is produced, which is also converted into scabs. When these are separated, at the end of five or six days, the tubercules are found to be much reduced. Two or three applications of the ointment, at intervals of a week, usually effect a cure. (*Bull. Gén. de Thérap.*, 1854, p. 530.) For the erythematous variety, moderate stimulation in the advanced stage is the most appropriate treatment.

III. MOLLUSCUM.

This name was given by Bateman to a complaint characterized by the appearance of numerous tubercules, varying in size from that of a pea to that of a pigeon's egg, spherical, or flattened, sometimes pedunculated and pendulous, and either of the colour of the skin, or somewhat brownish. They have little sensibility, and no tendency to inflammation or ulceration. According to Bateman, they contain an atheromatous matter. They are apt to be stationary, and continue indefinitely, without affecting the general health.

A variety denominated by the same author *Molluscum contagiosum*, from its supposed contagious nature, has been ascertained to be a disease of the sebaceous follicles, and has been placed by M. Caillault, who has written an elaborate dissertation on the subject, among the varieties of *Acne*. (*Arch. Gén.*, *4e sér.*, xxvii. 47, Sept. 1851.) The affection had been previously noticed and described by Dr. Patterson, of Leith, Erasmus Wilson, and several other writers. It occurs most frequently in children, and is seated preferably in the face or neck. The little tumours vary from the size of a millet-seed to that of a pea, are somewhat translucent, and are either sessile, or attached by a very short peduncle. But their distinctive character is the existence at the top, or on one side, of a small orifice, which allows the escape, spontaneously or under pressure, either of a milky fluid, or of the ordinary sebaceous matter. Sometimes they become inflamed, discharge their contents, and form ulcers, which cover themselves with scabs, and ultimately heal, leaving sometimes a surface perfectly natural, sometimes a scar not unlike that of the vaccine disease. Another mode of cure is their separation from the skin by the ulceration of the peduncle by which they are sometimes attached. A third termination is in small flabby excrescences, resulting from the withering of the tubercules. As the tumours make their appearance successively, it follows that, in the same case, may sometimes be seen all their different states above referred to. The milky liquid which exudes from the tubercules appears, under the microscope, to consist of nucleated epithelial cells, diffused through a great quantity of fat.

The affection is mild, and is not known to have produced fatal results in any case. Its chief disadvantage is the disagreeable appearance of the face which it occasions. Bateman noticed tumefaction of the small cervical glands in the vicinity of the tubercules.

Little is known of the cause. It has been stated that Bateman believed the affection to be contagious. This mode of origin has been denied by subsequent writers; but some facts are adduced by Caillault, which would appear to render it highly probable. It is not impossible that the cells generated in the hypertrophied follicles may have the property, when transferred to another individual, of self-propagation in their new position. Such a transfer may readily take place by means of a pillow or towel, which may have received a portion of the milky fluid from the face of a person affected.

The treatment of these little tumours, as of other cases of excessive and retained sebaceous product, consists in exciting the skin to the proper performance of its function by friction with a rough towel, and by gently stimulant applications, such as Cologne water, or a weak solution of corrosive sublimate, or of sulphate of zinc. The tumours may also often be advantageously emptied of their contents by pressure. Bateman employed Fowler's solution internally, with supposed benefit, in a case of his contagious molluscum; but this remedy can scarcely be necessary.

IV. YAWS, OR FRAMBŒSIA.

This disease is characterized by an eruption of tubercules or excrescences, bearing some resemblance to the raspberry, whence it derived the title of frambœsia (from framboise, the French for raspberry); and *yaws*, the name by which it is known in the West Indies, is said to have a similar signification in one of the dialects of the western coast of Africa.

The complaint is said to be indigenous in Africa, and to have been conveyed thence into tropical America.

The parts in which the eruption is most abundant and largest, are the face, axilla, groins, and vicinity of the pudenda and anus; but it may appear on any portion of the body, and is not uncommon in the scalp.

Symptoms.—In some instances, the eruption occurs without any preliminary disorder, in others, is preceded by febrile symptoms, with langour, pains in the limbs, &c. It appears first as small red points, like flea-bites, which soon rise into pimples, not larger than the head of a pin. These rapidly increase in size, until they become from half an inch to an inch in diameter. In a week or more the tubercules exude a fluid at top, by the concretion of which they are covered with scabs. Beneath these a fungous growth springs up, having a granulated surface, like that of a raspberry, to which fruit they bear some resemblance also in colour, size, and shape. From one to three months elapse before these fungous excrescences are fully formed. In the mean time another crop of the eruption not unfrequently rises, which undergoes the same changes; so that the patient exhibits the disease in its different stages at the same time upon his body. When the number of the excrescences is great, their size is usually small; when few, it is apt to be larger. They are without pain, except when they occur upon the palms of the hands, and the soles of the feet, where, in consequence of the pressure made by the firm cuticle, they sometimes occasion so much soreness as to prevent the patient from walking. Their colour in vigorous subjects is reddish, in the feeble and cachectic sometimes whitish. They do not produce healthy pus, but discharge an ichorous fluid, which concretes into crusts. The hair in the parts affected loses its colour, and becomes white.

When the eruption has attained its height, it continues long without much change. Among the excrescences, one is generally observed larger than the others, being an inch or more in diameter, which is called the *master* or *mother yaw*. This becomes depressed, while the others remain elevated, and assumes the form of an ulcer, with a foul surface, from which an acrid fluid exudes that excoriates the neighbouring skin.

After a variable length of time, which is shorter in children than in adults, and in the vigorous than the infirm, the tumours begin to decline, gradually sink to the level of the skin, and ultimately disappear, leaving only in a few instances any scar or depression. When a scar occurs, it is usually somewhat larger, but more shallow, than that left by the vaccine disease. The mother yaw generally leaves a scar. The complaint appears, like the eruptive fevers, to run a certain course, which varies in length, in different individuals, from six or eight months, to one, two, or three years; being usually from six to nine months in children, and a year or more in adults.

The yaws does not appear to be a dangerous disease; though, in persons of bad constitution, it is said that ulceration of the fauces and falling of the nose take place, with caries of the bones. But may it not be that syphilis, in such cases, has mingled with the frambœsia?

Causes.—The only known cause of the disease is contagion. This does not operate through the atmosphere, but, like the vaccine virus, only by the contact of the matter of the sores with an excoriated or wounded surface. Like the exanthematous contagious diseases, it attacks the same individual as a general rule but once. Children are most susceptible to the contagion; and negroes are said to be more so than whites. The period of incubation appears, from the experiments and observations of Dr. Thompson, to be about two months. (Rayer *on Dis. of the Skin*, Am. ed., p. 418.)

Treatment.—It is the general opinion of practitioners in the West Indies, that the best plan is to allow the disease to run its course until it has attained the period of decline, and then to interfere only in order to support the strength of the system, and thereby enable the patient to throw off the remains of the complaint. At first, therefore, they content themselves with prescribing a wholesome regimen, cleanliness, &c.; and, at the proper period for acting, direct the use of tonics and alterative diaphoretics, as quinia, the mineral acids, the chalybeates, the compound decoction of sarsaparilla, the antimonials, and sulphur. Mercury is also sometimes moderately employed in this stage. Different opinions are entertained as to the value of this remedy in the yaws. Some of the French West India practitioners recommend it as highly efficacious; the English, on the contrary, declare that, though it will sometimes remove the eruption for a time, it is sure to return, and with increased violence. The latter, therefore, use it only as a gentle alterative towards the close of the complaint. Under the same circumstances, especially when there might be ulcers indisposed to heal, it is probable that iodide of potassium would prove successful. During this course of medicine, the diet should be nutritious and of easy digestion, the patient should be warmly clad, to protect him against the changes of temperature from day to night, and his health should be promoted by moderate exercise.

As to the local treatment, little is at first required besides cleanliness, and emollient applications when inflammation is developed. In the latter stages, caustic applications sometimes become necessary, in order to alter the action of the ulcerated surfaces, and to destroy obstinate excrescences. For this purpose, nitrate of silver, red oxide of mercury, chloride of zinc, or the mineral acids may be used. The *arsenical paste of Frère Côme* is recommended by Cazenave and Schedel, as having been employed advantageously by M. Biett in this and other cases of obstinate ulceration, and never with any injury. But the caution was used, not to apply it at one time over a portion of surface larger than about half a dollar.* Biett once employed the actual cautery successfully, when other means had failed.

V. KELOID.

Syn.—*Cheloidea.*—*Kelis.*—*Keloide, Fr.*—*Cancroide, Fr.*

THIS is a peculiar affection of the skin and subcutaneous tissue, named, according to some, from its shape like that of a lobster or crawfish (χηλη, *the claws of a crab*), according to others, from its resemblance to the scar of a burn (χηλις, *a spot as if made by a burn*). It was first fully described by Alibert. It is in the form of an excrescence, somewhat flat at top, square, oval, oblong, or cylindrical, but usually more or less irregular, with processes shooting out from the main body, giving it a fancied resemblance to various objects, as to a lobster, a bird with expanded wings, &c. It is usually of a deep rose colour disappearing momentarily under pressure, smooth and shining upon the surface, hard and resistant to the touch, and marked with tendon-like lines stretching across the surface. Very small at first, it gradually extends to the length of one or two inches or more. The extension is effected by the projection of claw-like processes, which produce, apparently by contraction, a puckered state of the skin, which, with the shining and smooth surface, gives to the tumour an appearance somewhat like that of the cicatrix of a burn. Sometimes there is only one tumour, which is situated preferably on the middle of the anterior part of the chest, nearly in a line with the nipples; but not unfrequently there are several, and they are sometimes found on the neck, back, arms, thighs, and even on the face. When numerous, they are usually small. Their growth is generally attended with heat in the part, itching, pricking, and sometimes lancinating and burning pains, which cause great suffering to the patient; but occasionally no other uneasiness is experienced than a feeling of stiffness or tension of the skin. The disease continues for a long time with little change, almost never ulcerating, and seldom undergoing resolution. Instances, however, have occurred in which the tumours have spontaneously disappeared, leaving a firm white scar behind. They are not malignant, and do not materially affect the general health. Examined by the microscope, they have been found to be of a fibrous nature, as if a hypertrophy or outgrowth of the true skin, though they are said to begin in the subcutaneous tissue, and to involve the skin secondarily. That the affection is constitutional is inferrible from the fact, that persons predisposed to them are apt to have them developed in the cicatrices of ordinary ulcers. In one case which I have seen, the patient ascribed them to the application of some vesicating substance. The case of a soldier is on record, in which they were supposed to have resulted from a flogging; having made their appearance three months afterwards, upon the spot where the strokes of the implement had chiefly fallen. (*Lancet*, March, 1863, p. 268.) The affection is said not to be uncommon among the negro population of our Southern States. (*Bost. Med. and Surg. Journ.*, liii. 196; from *South. Med. and Surg. Journ.*) The cause is unknown. The complaint is not contagious, and has not generally been considered hereditary; though Dr. J. W. Burnett, of Boston, has recorded one instance in which it seemed to have descended from a father to his children. (*Am. Journ. of Med. Sci.*., N. S., xxvi. 370.) Treatment has been found of little avail. The use, however, of iodine or its preparations, both internally and locally, would seem to be indicated. The tumours have been repeatedly extracted by the knife; but have generally, if not uniformly, returned.

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* This paste is made by mixing with water a powder containing ten grains of arsenious acid, two scruples of sulphuret of mercury, and ten grains of powdered animal charcoal.

Keloid of Addison.—The late Dr. Addison, of London, described, under the name of "*true Keloid*," another affection, different from Alibert's disease, but in his opinion better meriting the title, as it much more exactly resembles the scar of a burn, from which the name originated. This has its seat in the subcutaneous tissue, and first appears in the form of a smooth, round or oval, white spot, from a few lines to an inch in diameter, scarcely elevated, without pain or uneasiness, and surrounded by a zone of redness. The spot increases, and after a time acquires a faint yellowish or brownish tint, and a mottled aspect. As the disease advances, a sense of pain and constriction is experienced, and the parts become hard and rigid beyond the original seat of the disease. In the extremities, this hardness may sometimes be traced like a cord along the limb, which it bends and shortens so as to interfere with its movements; and at length the whole limb may become hard and immovable by the extension of the disease, and the patient rendered a cripple for life. The skin, which was at first simply puckered, now shrinks, assumes a smooth glistening appearance, and a reddish or yellowish colour, or that of a dead leaf; the cuticle exfoliates; and a disposition to superficial ulceration is evinced, in the absence of which, nodular elevations are exhibited; and the whole surface closely resembles the remains of an imperfectly cicatrized burn. Reddish claw-like processes sometimes proceed from the boundary of the discoloured surface into the neighbouring skin, very like those of the keloid of Alibert. The cause of the affection is unknown; in character it is probably analogous to fibroid degeneration. No treatment has been found to have any effect, except the use of iodine, which has appeared to produce a somewhat favourable impression. (*Medico-chirurg. Trans.*, 1854, p. 37.) *

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* A case of this kind, the only one that I have seen, was in a young lady from Virginia, in whom I was enabled to recognize the disease at a glance, from its resemblance to the wax models prepared for me by Mr. Town, of Guy's Hospital, London, and copied from cases of the disease received into that institution. I recommended the use of iodine, cod-liver oil, and the warm bath, but gave little hopes of amelioration. I have not heard of the result. (*Note to the sixth edition.*)

VI. VITILIGO AND VITILIGOIDEA.

Vitiligo.—The term *vitiligo*, said to have originated from a supposed resemblance of the surface affected to the colour of veal (*vitulina*), has received various applications. Celsus embraced under it different forms of what are now known as lepra and psoriasis, and another affection which is probably identical with the *lupus non exedens* of modern writers. Erasmus Wilson considers it a mere synonyme of this variety of lupus. Alibert applied it to a simple loss of colour without alteration of texture, constituting a partial albinism; and Cazenave uses the term in the same way; but embraces also, in his description, an affection of the scalp, which appears to be the same as that described in this work as *Trichosis decalvans.* Willan, followed by Bateman, describes, under the name, a peculiar tuberculated affection, somewhat resembling, yet distinct from lupus.

The following is an abstract of the account of vitiligo given by Bateman. It consists of "smooth, white, shining tubercles" appearing about the ears, neck, and face, and sometimes over nearly the whole surface, with shining papulæ intermingled. These tubercules sometimes attain the size of a large wart in a week, and then subside, becoming level with the skin in about ten days. In other instances, they are smaller, but more durable, and, as they subside, extend in a particular direction, giving to the surface a veal-like appearance. The hairs are permanently lost on the part affected, which is left smooth and shining, with a morbid whiteness, continuing during life. The tubercules never ulcerate; and there is little constitutional disturbance. Treatment, whether internal or external, appears to have had little or no effect.

Vitiligoidea.—An affection has been described by Drs. Thos. Addison and Wm. Gall, in *Guy's Hospital Reports* for 1851 (vol. ii., part ii., page 265); which, from its resemblance to the vitiligo of Willan, they have named *vitiligoidea.* It presents itself in two forms; one in that of tubercules, from the size of a pin's head to that of a large pea; the other as yellow, slightly elevated patches with little hardness. The former they call *Vitiligoidea tuberosa*, the latter *V. plana.* That they are mere varieties of the same affection is shown by their having appeared in the same subject at the same time. In *V. tuberosa* the tubercules may be either distinct or confluent, and are sometimes attended with shining colourless papules. They appear on the limbs, trunk, or face; but are sometimes confined to the last-mentioned position. Their colour is yellow, mottled with a rose-tint, and with minute capillary blood-vessels ramifying over them. Being attended with some irritation, they are apt to be rubbed, and hence at their top are sometimes excoriated or inflamed. When cut into, they are found to consist of a firm tissue. In *V. plana* there are flat, slightly elevated surfaces, with a very moderate degree of hardness if any, of an irregular outline, and a yellow opaque appearance, slightly sensitive, showing themselves preferably on the eyelids, sometimes on the hands and wrists, and disposed to be symmetrical on the opposite sides of the body. In these, too, minute vessels were observed ramifying over the surface. All the patients except one were affected with obvious disease of the liver, and were generally more or less jaundiced; and the exceptional case was one of diabetes, in which the liver is known to be frequently diseased. There is reason, therefore, to think that the affection is essentially connected with hepatic disease, and depends immediately on the disordered condition of the blood originating in that cause. The eruptions seem to have no regular period of progress, duration, or decline; but to depend for their continuance on the visceral disease. The affection is generally chronic. In one instance it continued stationary for four years, at the end of which the patient died of the internal complaint. Treatment appears to have had little effect; though some benefit seemed to follow the careful and repeated application of nitrate of silver. Some of the tubercules may gradually and spontaneously decline, while others remain unaltered.

Article VII.

DISCOLORATIONS, OR MACULÆ.

DISCOLORATIONS of the skin connected with diseases of other parts of the system, or of the skin itself, if attended with any prominent change besides that of colour, are not included under the present heading. It is to idiopathic discolorations, if the term is admissible in that application, that allusion is here made. They are the result of some change in the production of the colouring matter of the skin, and have their seat in the lower epidermic layers, though the real pathological condition is probably an altered action of the superficial portion of the corium. As the colour of the skin depends on the presence of the pigment cells, it may be deepened or rendered lighter by an increase or diminution in the quantity of these cells, and in other ways changed by an alteration in their character. In either case, maculæ are produced, which may be only in spots of variable size, or may occupy large and continuous portions of the surface. A connection has often been observed between discoloration of the skin and disease of the nervous centres, whether cerebral, spinal, or ganglionic; and it is in the highest degree probable that this connection is occasionally at least, if not frequently, one of cause and effect. How the nerve-centres should affect the colour of the skin is not at first sight very obvious; but, when the influence of these centres over the capillary circulation, as proved by the experiments of Bernard and others, is considered, it will not be difficult to understand how, by an increase or diminution in the supply of blood, independently of any more direct action, they may modify the pigment-producing function, as well as that of secretion or nutrition residing in the same tissues.* The following are varieties recognized by dermological writers.

1. *Lentigo.—Freckles.*—From ancient times, the name of lentigo has been applied to those small, yellowish, brownish-yellow, or greenish-yellow, irregularly roundish spots, which are denominated freckles. They are not elevated above the general surface, and are unattended with itching, or other abnormal sensation. They exist most abundantly on the parts most exposed to the light, as the face, neck, hands, &c., and especially on the face; but are found also on other parts of the body. They are congenital, or appear very soon after birth, and may continue through life, or disappear at puberty. It is a question whether they are generated in subsequent life. Spots which in no respect differ from them in appearance are frequently produced, in certain persons, on exposure to the sun's light; but these disappear in the absence of the cause, while the others are permanent, or only change with some general change of system in the progress of growth. In those affected with them from early life, they are deepened and increased by exposure to the sun. They are found generally in persons of fair complexion, with light and especially sandy hair. Congenital lentigo cannot be removed by remedies; though it may, when aggravated by any special cause, be advantageously treated by gently stimulant applications, such as those mentioned under the following head.

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* See an elaborate essay on morbid pigmentary changes by Prof. Thos. Laycock, of the University of Edinburgh, in the *British and Foreign Medico-chir. Rev.*, Am. ed. (Jan. 1861, p. 135, and April, p. 280).—*Note to the sixth edition.*

Ephelis.—This term has been variously applied, by some as synonymous with lentigo, by others to an affection closely analogous if not identical with pityriasis versicolor. The origin of the term (*επι* and *ἥλιος* sun) would confine it to discolorations produced by exposure to the sun. Perhaps we may be justified in extending it to all those brown patches, depending on mere excess of colouring matter, by whatever cause produced, which have considerable extent; while the smaller spots may be considered as belonging to the freckles. When produced by exposure to the sun, the affection appears in parts unprotected by the dress, and especially in persons of fair and delicate skins, as in women and children. It occurs generally in summer and disappears in cold weather. Perhaps under this head, rather than under that of pityriasis, may be ranked the discolorations which sometimes appear in women during pregnancy, or in the menstrual period, and disappear when these processes have ceased. Similar changes sometimes occur without any assignable cause, occupying either large portions of the skin, so as to give it a pied appearance, or even the whole surface of the body. In these cases, which are very rare, the discoloration is without elevation, desquamation, or abnormal sensation of any kind, and is apt to be permanent. Erasmus Wilson calls the affection *melanopathia.*

In those forms of lentigo and ephelis which depend on exposure to the sun, the treatment consists in obviating the cause, and in soothing or sedative applications to the affected surface, as the emulsion of sweet or bitter almonds, the ointment of rose-water, a mixture of lime-water with olive or almond oil, and weak lead-water when there is considerable heat or irritation. In other forms of the two affections, advantage is sometimes derived from gently stimulant applications, as a weak solution of corrosive sublimate or of sulphate of zinc (gr. ij to f℥i), lime liniment with a little ammonia, the mineral acids very much diluted (f℥j to Oj of water), weak solution of citric acid or diluted acetic acid, &c.; and it might sometimes be advisable to apply one of these irritants, or some other of similar character, in connection with the ointment of rose-water, or almond emulsion. In the case of a woman under the care of Dr. Greenhow, in which the skin was very extensively discolored, the body generally being blackish-brown, and the limbs participating to some extent in the affection, a very considerable diminution of the discoloration took place, under the use of an alkaline warm bath thrice weekly, and full doses of nitromuriatic acid taken internally. (*Med. Times and Gaz.*, April, 1864, p. 365.)*

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* *Chromidrose.*—Under this name, a peculiar black discoloration of the eyelids, extending sometimes to the nose, cheek, and upper lip, was described by M. Le Roy de Méricourt in the *Archives Générales.* As observed by him, it occurred preferably near the sea-shore, and most commonly in women, particularly young women, though it had been noticed also in men, and in one of these upon the hand instead of the eyelids. (*Arch. Gén.*, Août, 1861, p. 188.) Previously to the publication of Dr. Le Roy de Méricourt's paper, the affection had been noticed by others. The first recorded case was that of a girl, described so early as 1709, by Mr. James Yonge, in the London *Philosophical Transactions.* In 1831, Dr. Billard described a similar affection, under the name of *cyanopathie cutanée*, in the *Archives Générales;* and scattered cases were afterwards observed by different practitioners. Dr. Neligan published a paper on the subject in the 19th volume of the *Dublin Quarterly Journal*, and Dr. J. T. Banks another in the 25th volume of the same journal (May, 1858, p. 256), from which this historical sketch has been mainly drawn. The discoloration has been observed more especially on the lower eyelids; and the young women affected were in general subject to some derangement of menstruation. The discoloration appeared irregularly, and disappeared, to return again, without, in many instances, any assignable cause. It was not always equably diffused, being deepest in the grooves or folds of the skin. It imparted a black stain to a white handkerchief rubbed upon it, and could generally be partially, if not entirely removed in this way, especially with the aid of glycerin. The colour, under the microscope, appeared to be owing to numerous minute granules adhering to the surface, and did not affect the tissue of the skin. An obvious supposition was that the black matter was a secretion from the skin, proba-

Pigmentary Nævus.—This is a congenital dark discoloration of the surface, occurring in spots, usually small, but sometimes many inches in diameter, with little if any elevation, often covered with hairs, and in vascularity and sensibility not differing from the healthy skin. They are permanent but quite harmless, and altogether different from the vascular nævi, which sometimes increase, and require the interference of the surgeon.

Albinism.—*Albinismus.*—*Leucopathia* (E. Wilson).—In the affections just referred to, there is an increase of the pigmentary matter of the skin. The one now under consideration consists in a diminution or total absence of this matter. Persons extensively affected in this manner are called albinos. They are found among people of all countries; but the affection is most striking in the black races, in consequence of the greater contrast. Not only is the colouring matter of the skin wanting, but also that of the hair, and of the choroid coat of the eye, which is thus rendered extremely sensitive to light, so that the individual can see better at night than in the day. The affection is usually congenital; but sometimes it is accidental, occurring at various periods after birth. In the latter case, it is more apt to be partial, giving the surface a pied appearance. The colour of the affected portions of the skin is a dead white. When congenital, it may be considered as irremediable; but cases of partial albinism, occurring accidentally, may sometimes be relieved by local stimulants and general tonics, which have the effect of exciting the colour-producing function of the skin.

Article VIII.

PARASITIC AFFECTIONS.

UNDER this head are included affections which depend upon a parasitic growth, animalcular or cryptogamous, seated on the skin, or more or less deeply in its structure. Of the affections dependent on an animal parasite, there is only one which I shall consider, viz., *Scabies*, or *the itch.* Of the vegetable, I shall notice, successively, 1. *Pityriasis versicolor;* 2. *Sycosis* or *Mentagra;* 3. *Porrigo* or *Favus;* and 4. *Trichosis.* One of the varieties of Molluscum, said to be of similar origin, and of a contagious character, might also

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bly from the sebaceous follicles, and hence the name of "*stearrhœa nigricans,*" given to it by Dr. Neligan. After all, however, it seems probable, from a most careful examination of a characteristic case by a committee of the *Medical Society of the Hospitals at Paris,* reported by Dr. Béhier, and published in the *Archives Générales* (Août, 1861, p. 187), that the affection is, at least occasionally, factitious, and is produced by rubbing some colouring substance on the part affected; being another example of those feigned diseases, by which nervous and hysterical women are not unfrequently disposed to impose upon their medical attendants, either through a sort of insane impulse, or a morbid desire to win their attention, or engage their sympathies. In the *Archives Générales* for February, 1859 (p. 224), is an account of a case similar to the preceding, except that the discoloration was of an indigo colour instead of black; and the particles removed from the surface presented the microscopic characters and reaction of indigo. Now, as a blue pigment matter, analogous to indigo, is believed to have been generated in the system, being sometimes found in the urine, it is barely possible that, in this instance, the colouring matter may have been a product of secretion; but the probabilities are very greatly in favour of an artificial origin of the affection. Nevertheless, that such a discoloration of the skin, as above noticed, may take place as a morbid condition, and consequently that some of the cases of "*chromidrose*" may be really what they purport to be, is inferrible, from the results of a microscopic and chemical examination, by M. Charles Robin, of a portion of slate-coloured skin from the axilla, in which a blackish matter was found in the ducts of the sudoriparous glands, obviously a product of morbid secretion. As in the cases above described, the colour was imparted to the neighbouring skin, and could be partially removed by friction with a handkerchief. (*Arch. Gén.*, Août, 1863, p. 158.)—*Note to the sixth edition.*

be added to the list; but a close resemblance to the ordinary form of the affection, and its yet somewhat doubtful nature, will justify us in retaining it for the present in its old position.

I. Animalcular Parasitic Affections.

SCABIES.

Syn.—*Itch.*—*Psora.*

THIS is a contagious eruption, usually vesicular, in which the vesicles are somewhat acuminate, generally distinct, and always attended with more or less itching.

By some writers the disease has been ranked with the pustules, by others with the vesicles; but the fact appears to be that, though the eruption is generally at first vesicular, it is not unfrequently attended with pustules; and whether one or the other shall predominate depends very much on the state of the system.

Bateman makes several varieties of scabies; but these have been discarded by recent authors, nor does there appear to be any sufficient ground for their retention; as the disease in all its forms has but one cause, and requires the same treatment.

All parts of the body are liable to be affected, unless perhaps the face, which appears to be nearly if not quite exempt; and the disease is very rare in the scalp. The parts most frequently attacked are the flexures of the joints, contiguous surfaces, and those corresponding with the motions of flexion; probably because the cuticle is most delicate in these positions. Hence, the eruption is apt to appear between the fingers, in the cleft of the nates, in the bend of the elbow, in the axilla, groin, and ham, upon the anterior part of the wrist and forearm, and on the surface of the abdomen. The hand is more liable to be affected than any other part, being most exposed to the cause. It is said that anything which tends to harden the hand renders it less susceptible to the contagion.

The disease is often confined to one spot, as to the space between the fingers, the hand, or the wrist, and in most instances occupies only a surface of moderate extent. Sometimes, however, it spreads into all parts of the body, choosing especially the seats already mentioned. It is rare in the hairy scalp.

Symptoms.—The first sign of the disease is an itching sensation, which, upon examination, is found to proceed from a minute, acuminated, reddish eruption, with a transparent viscid liquid at the summit. The vesicles are almost always distinct; and not clustered like those of eczema. Sometimes they are very few, and spread slowly; in other instances are numerous, and quickly diffused. Being torn by the nails of the patient, they are soon covered with small scales from the concretion of the effused liquid; and among them are generally interspersed little red bloody points, or scratches, from the same cause. Pustules are also sometimes formed, which end in scabs; and several of them running together occasionally give rise to excoriated surfaces, from which pus exudes. The affected parts itch exceedingly, especially at night in bed, or after the use of stimulating drinks or exciting condiments; and the patient cannot refrain from scratching, which, indeed, is sometimes a source of positive pleasure.

The complaint is said to be most rapid in its progress in persons whose skins are delicate, and at the same time full of blood; and to be slow in the feeble and cachectic. It is said also to be checked, and even for a time almost to disappear, upon the supervention of an acute internal disease.

The proper vesicles of scabies are often associated with papular eruptions, eczematous vesicles, pustules of ecthyma and impetigo, small furuncles, &c., which are thought to be engendered by the irritation of the existing disease, of the scratching, or of the remedies used in the cure, and which sometimes tend greatly to obscure the diagnosis.

The itch, if not cured, continues indefinitely for years or even a lifetime; but it has no fatal tendencies, and is never dangerous. The affection is entirely local; and any disorder of constitution that may attend it is accidental.

It has long been known that a minute insect might occasionally be found in or near the vesicles of scabies; but, though its existence has been repeatedly demonstrated, yet, as many failed to discover it after the most careful search, some doubt appeared to rest upon the subject, until, in the year 1834, the point was conclusively settled by M. Renucci, a young Corsican in Paris, who had learned in his native land the art of extracting the little animal. It appears that the insect does not reside in the vesicle, but at a little distance from it. About the fourth of a line from the vesicle, a white speck may sometimes be seen, and, upon the removal of the cuticle by a pin, the animal becomes visible, and may be extracted upon the point of the instrument. But more frequently, there is a furrow of one or two lines in length, which may be seen running from the vesicle either straight or somewhat tortuously; and at the further end of this furrow the insect may be found. It was originally known by the name of *Acarus scabiei;* but M. Raspail, who described and figured it, has proposed the title of *Sarcoptes hominis.* It is not found in the vicinity of all the vesicles.

Causes.—Contagion is the only cause of scabies, and this acts only by contact. The disease may be received either directly from the individual affected, or indirectly through articles that may have been contaminated, such as clothes and bedding. Neither age, sex, season, nor climate affords exemption from it. Yet certain causes favour the influence of the contagion. It is most effective among a crowded and filthy population; and hence to be attacked with it has generally been looked upon as somewhat disgraceful, though no degree of care or cleanliness can under all circumstances guard the person effectually. The disease is more common with children than adults, with men than women, in summer than in winter, and in hot than in cold climates. Persons whose trades render it necessary for them to handle old clothes are peculiarly apt to be attacked. The period at which the complaint appears, after exposure to the cause, differs with the age and the season, being shorter in proportion to the greater delicacy of the skin, and the warmth of the weather. In children it varies from two to five days, in adults from one to three weeks, in old persons it is still longer. (*Cazenave* and *Schedel.*)

From the knowledge of the existence of the acarus, it was a very natural conjecture, that this insect would prove to be the real agent in the communication of the disease. Against this idea was advanced the fact, that the acarus can be found only in a few comparatively of the whole number of vesicles. But the difficulty has been removed by the discovery, that the female insect, which burrows in the skin in order to deposit her eggs, often leaves her hole at night, and makes a new nest elsewhere. M. Bourguignon has determined the question, by proving that the disease cannot be communicated by inoculation with the matter from the vesicles, while a transplanted acarus will give rise to the true vesicle of scabies. From the researches of MM. Delafond and Bourguignon, it appears that the proper itch insect, or sarcoptes hominis, affects also the dog and lion, and may sometimes be found in the horse; so that the disease may be derived by man from these animals. (*Arch. Gén.*, Janv. 1858, p. 80.) In the *Boston Med. and Surg. Journ.* for Sept. 6, 1855, is a communication from Dr. P. Pineo, showing that the disease is sometimes actually taken from the dog by man, and the necessity of guarding against this source of contagion.*

Diagnosis.—Though this is generally easy, there are cases in which much difficulty is experienced, even by the most skilful. The circumstance that the characteristic eruption, in this as in various other itching affections, is often changed by scratching, and a certain resemblance thus given to very different diseases, is one of the sources of embarrassment. Another is the not unfrequent intermixture, to a greater or less extent, of other affections. The cutaneous diseases which are most liable to be confounded with scabies, are different forms of prurigo and lichen among the papulous, and eczema among the vesicular. In relation to the two former, it will be found, upon a close examination, that, though there may be occasionally a vesicle, yet the predominant eruption is a small, solid pimple, without liquid contents. Besides, they appear most commonly on the outer surface of the limbs, while scabies prefers the inner; they are often clustered in patches, while this is almost always distinct; and, though they excite itching, yet it is also of a burning or tingling character, very different from the unmingled sensation which has given its name to the more vulgar eruption. The circumstances in which the affection originated must also be taken into account, scabies being always contagious, and the others never. In eczema, the vesicles are rounded or flattened instead of being acuminate, occur usually in patches instead of distinctly, occasion a more painful sensation, and may sometimes be clearly traced to a non-contagious, but never to a contagious origin. It is asserted that, in some cases of itch, there is no eruption whatever, but not the less intense itching on that account. Others again have been noticed in which there were only pimples. It has already been stated that the affection is sometimes mixed with pustules, or altogether pustular. These differences must be ascribed to peculiarities, either of the constitution or the skin. Hence it may be understood how some cases of supposed prurigo or ecthyma may have seemed contagious. A proper diagnosis can be made in these cases only by detecting the insect. When this cannot be found, its ovum frequently may, and this is equally characteristic. It is oval, about $\frac{1}{800}$ of an inch in its long diameter, and often contains the fœtal insect, visible under the microscope.

Treatment.—The treatment of scabies is exceedingly simple. Being exclusively local, it requires no constitutional remedies; though Biett recommends that some blood should be taken from the robust and plethoric. This, however, can very seldom be requisite. In all instances, it is best to obviate costiveness if it exists; not so much in reference to the cure of the cutaneous affection, as upon the general principle of keeping the functions in a healthy state under all circumstances.

Upon the whole, the most effectual and safest remedy for the itch is sulphur ointment. This appears to be a specific in the disease; and it is very seldom that any other remedy is required. The ointment of the U. S. Pharmacopœia should be used; and its disagreeable odour may be corrected, if deemed advisable, by a few drops of the oil of bergamot to the ounce. The application should be made once or twice daily, and, if the disease is extensively diffused, to the whole surface of the body. The patient should be stripped naked at bedtime, thoroughly anointed in a warm apartment, and allowed to remain all night with the ointment upon him. In the morning, he should be washed clean by means of a bath or otherwise, and put on perfectly clean clothing. Four or five applications of this kind will almost always cure the disease. Sometimes it may be necessary to continue the treatment for ten days, or two weeks, in obstinate cases.

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* MM. Delafond and Bourguignon have also shown that there is another genus of parasitic insects, belonging like sarcoptes to the family of the acari, which inhabit various species of the lower animals, in which they produce certain diseases, not by burrowing, but by travelling over the skin, and here and there inflicting a wound. They cannot live on the human skin, and the affection is not, therefore, imparted to man by the animals they inhabit. (*Arch. Gén.*, Janv. 1858, p. 29.)—*Note to the fifth edition.*

A great number of substances have been proposed as adjuvants of the sulphur; but few that increase its efficacy. Biett, after trying numerous plans in the Hospital Saint-Louis, at Paris, adopted the following as the most effectual. Of an ointment composed of two parts of sublimed sulphur, one of carbonate of potassa, and eight of lard, he directed half an ounce to be applied, morning and evening, to all the affected parts; the patient receiving a bath every day or every other day. The mean duration of the treatment was twelve days. This ointment is much weaker in sulphur than that of the U. S. Pharmacopœia. The advantage of the alkaline ingredient is supposed to be that it removes the superficial layer of the epidermis, and thus gives an easier access of the sulphur to the animalcule.

Sulphur baths, and the vapour of sulphur, have also been much used; but are less effectual than the ointment. A lotion was employed by Dupuytren, which, though also less efficient than the ointment, may be used when the patient is averse to inunction, or the application of the remedy may be inconvenient. The lotion consists of four ounces of sulphuret of potassium dissolved in a pint and a half of water, with the addition of half an ounce of sulphuric acid. It is to be applied twice daily to the affected part. All skins, however, will not bear an application so irritant.

A liquid made by boiling together two parts of sulphur, one of lime, and ten of water, until the two former unite, and then decanting, has been found promptly effectual by M. Bourguignon. A pint is sufficient to cure several cases. The liquid is rubbed on the skin for half an hour, at the end of which the insect has been killed, and nothing more is necessary than to wash the surface. (See *N. Y. Journ. of Med.*, Sept. 1856, p. 262.)

The smell of sulphur has always constituted a strong objection to its use with many persons; and on this account numerous substitutes have been tried. Among these, the preparations of mercury have proved efficient. The mercurial ointment, calomel ointment, citrine ointment, ointment of iodide of mercury, and solution of corrosive sublimate have been employed successfully; but a great objection to these preparations is their liability to salivate.

White hellebore has enjoyed considerable reputation. The officinal ointment of the root was formerly used. Biett found it to cure the disease, upon the average, in about two weeks, and without injury to the patient. The ointment of veratria has been substituted in the U. S. Pharmacopœia. The ointment of sulphuric acid, of the old Dublin Pharmacopœia, weakened by an equal proportion of lard, has also been used with success. Inunction with lard and oil, without medicinal impregnation, is said by M. Basin to cure the itch, in from four to six applications. (See *Am. Journ. of Med. Sci.*, N. S., xxi. p. 485.) M. Bourguignon, in experimenting on substances poisonous to the insect, found iodide of sulphur and solution of iodide of potassium the most energetic, and next to these a solution of the alcoholic extract of stavesacre. The last is preferable as a remedy for the itch, because less irritant to the skin. He, therefore, employs an ointment made by digesting over a vapour bath, for twenty-four hours, three parts of stavesacre in powder with five parts of lard, and then straining. This ointment will cure the disease in four days. (*Ed. Month. J. of Med. Sci.*, July, 1852, p. 63.) Benzole has been recently very strongly recommended. It is said to kill the insect instantaneously. The skin should be rubbed with a dry linen cloth till reddened, and the liquid then applied. It causes a smart burning sensation, but only where the vesicles exist. In about an hour the vesicles are dried up. Nothing more is afterwards required than to wash the surface with soap and water for the purpose of cleanliness. (*Arch. Gén.*, Août, 1857, p. 236.) Petroleum may be substituted, probably with equal effect. The application of chloroform is said to kill the insect, while, at the same time, relieving the irritation produced by scratching. (*Am. J. of Med. Sci.*, July, 1859, p. 236.) Phosphorized oil, made by heating one part of phosphorus in fifty parts of olive oil, is reported by M. Metzel, of the Austrian Army, to be a sure remedy, which is not liable to the objection of irritating the skin. (*Med. T. & Gaz.*, March, 1865, p. 281.)

Many other remedies have been recommended; but none are more effectual than some of those mentioned.

It is a caution which should always be observed, in relation to the clothes of persons affected with the itch, that, before being touched, they should be thoroughly fumigated with sulphur. By speedily and carefully washing the hands in soap and water, after touching a patient with the disease, the reception of it may almost always be prevented.

II. Cryptogamous Parasitic Affections.

I. PITYRIASIS VERSICOLOR.

UNDER this name, Willan described an affection, which, though it has some of the characters of the scaly eruptions, is also in some respects peculiar. In earlier editions of this work, considering it essentially a disease of the colour-producing function of the skin, I ranked it with the maculæ, under the name of *ephelis;* and Erasmus Wilson, with a similar view of its nature, gave it the title of *chloasma.* Subsequently, I placed it with the Pityriasis of Willan, to which it belongs by its scaly character; but, as it is now pretty well ascertained not only to be attended with a peculiar parasitic fungus, but to be caused by the fungus, its proper place appears to be with the affections of a similar origin. It first appears in the form of small, grayish, or dull-reddish stains of the skin, which soon assume a yellowish, brownish-yellow, or tawny colour. They are seated usually on the anterior part of the neck and chest, the abdomen, the back, or the inner surface of the thighs, but may occur in any part of the skin. These spots enlarge and coalesce, forming large irregular patches, which sometimes cover extensive portions of the surface; so that, in some instances, the impression is given that they are of the natural colour of the skin, and that the unchanged parts are morbidly discoloured. There is no elevation of the surface, no constitutional derangement of any kind, and no other inconvenience than a moderate itching, which is increased by whatever excites the surface, as the warmth of the bed, and the use of stimulating food and drinks. The affection sometimes goes off in a few days, sometimes persists for months or years. It is accompanied with a slight mealy desquamation, which is, however, much less conspicuous than in proper pityriasis.

Eichstedt has demonstrated the existence of a microscopic fungus among the scales, consisting of round cells, and of fine filaments, short, serpentine, and rarely branched, to which the name *Microsporon furfur* has been given. It has been doubted whether this was the cause, or a mere attendant on the affection. There is reason to believe that, in some instances at least, the disease has proved contagious; and, if this be admitted, the presence of the fungus must also be admitted as the cause. It is easy to conceive that, in other cases, the sporules floating in the air may, under favouring circumstances, make a lodgment in the epidermis, and become developed and multiplied there. It has been said that want of due personal cleanliness favours the growth of the fungus. This is probable; and yet I have repeatedly seen cases of the disease, in which it would have been very unfair to suspect any want of due attention to this requisite. The affection has been ascribed to exposure to the sun, irritating articles of food, the abuse of spices and alcoholic drinks, derangements of the menses, and the suppression of hemorrhoidal discharges. It is apt to occur in women at the approach of the menstrual period, and to disappear when it is over. It sometimes also occurs in pregnant women, especially upon the face, and may either disappear after a short continuance, or persist during the period of pregnancy. It is possible that some of these causes may predispose to the affection by giving to the skin a condition favourable to the growth of the parasitic fungus; but this is the essential cause. In relation to the similar discoloration in pregnant and menstruating women, some suppose that it is a mere disorder of the colour-producing function, independent of any fungus; and this is probably true, at least in some instances.

The discoloured surfaces referred to above have, in some very rare instances, been observed to have a blackish colour, which has given rise to the name of *Pityriasis nigra*, applied to these cases in the works of Bateman and of Cazenave and Schedel, and to that of *Melasma* in the treatise of Erasmus Wilson. The complaint is probably of the same nature as the *P. versicolor*.

Treatment.—In relation to *P. versicolor*, local applications will generally effect a cure. I have long employed a solution of sulphate of zinc, in the proportion of two or three grains to the fluidounce of water, and found it, if diligently applied, uniformly successful, not only temporarily, but, so far as I know, permanently. The same is said of a solution of corrosive sublimate containing from one to three grains to the fluidounce. Sulphurous acid, as proposed by Dr. W. Jenner, on the ground of the parasitic character of the affection, or one of the sulphites dissolved in diluted vinegar, is said also to prove very efficacious. The patient should wash himself frequently with soap and water, and should after washing put on fresh and clean under-clothing. Mr. Winzar, of Salisbury, England, states that he has found a most effectual remedy in sulphuret of potassium, dissolved in the proportion of one drachm to three ounces of water. (*Lond. Lancet*, Oct. 1853, p. 360.) It is probable that all these remedies act either by removing or destroying the fungus.

II. SYCOSIS

Syn.—*Mentagra.*—*Tinea Sycosa* (Bazin).

The term sycosis is derived from συκον, a fig, probably from a supposed resemblance between the disease which it designates and the rough interior of that fruit. The complaint affects especially the hair follicles of the face. It may occupy the chin, upper lip, eyebrows, submaxillary region, or that part of the cheek where the whiskers grow. In other words, it is confined to the hairy portions of the face. It is sometimes also seated in the scalp, and, in Bateman's Synopsis, is named *Sycosis capillitii* when in this position, and *S. menti* when in the chin. But the division is unnecessary, as the affection is identical in the two positions. Sometimes it is limited to one portion of the face, sometimes affects all the hairy parts at the same time.

Sycosis does not usually make its attack without previous warning. The patient is for a long time affected now and then with an eruption, to which, however, he pays little attention. At length some portion of the chin or upper lip is affected with redness, heat, and painful tension, followed by an eruption of pimples, which, in one, two, or three days, are converted into pustules of various sizes, but not generally exceeding that of a millet-seed. Each pustule is usually penetrated by a hair. They are sometimes isolated, and sometimes in clusters, and may occur over a considerable space at the same time, or, beginning at a point, may gradually extend thence in different directions. In six or seven days they break, and form brownish scabs. In ten days or two weeks, these scabs separate, and the particular pustules have run their course. But others appear, the skin becomes inflamed, and the inflammation extends to the subcutaneous tissue, producing partial swelling and induration. The parts are now red, painful, and deformed; exhibiting pustules intermingled with large yellowish or greenish-brown scabs, which mat the beard together, and with tubercules of various sizes, sometimes as large as a pea or cherry, or even larger, with a raspberry-like surface, which suppurate very slowly. Plumbe says that a little pus is contained in the centre of every tubercule; but this statement has been found to be too general. Sometimes a small spot only is affected, and presents a dark-coloured, prominent scab, which has a very peculiar appearance. In some old cases, the hair falls from particular spots, though it grows again, and ultimately acquires the same appearance as it had originally. Sometimes, however, there is a permanent loss of the hair in spots. When the part returns to health, there is a gradual diminution of the swelling and induration, the existing tubercules are resolved, new pustules cease to appear, and the disease ends by a desquamation of the cuticle. It is very uncertain in its duration, and its course cannot be predicted. Sometimes it speedily yields to remedies, at other times it resists them obstinately, and runs on for years with various vicissitudes. Some persons are attacked every winter, and become free from the disease in summer.

Causes.—The main cause is probably one or more microscopic fungi, seated on the surface of the root of the hair, between it and the inner surface of the hair follicle. So early as 1840, M. Gruby, of Vienna, discovered a fungus in this situation, which he called *Microsporon mentagrophytes;* and subsequently the *Tricophyton tonsurans* was found, in some cases, by M. Bazin; so that both of these probably serve as the exciting cause of the affection, by producing inflammation in the follicles. A predisposition to the disease appears to be generated by intemperance, and low debauchery and filth; but it occurs also in the temperate, and in those exemplary in all respects. Disorder of digestion, gouty or rheumatic irritation, or other derangement of health, is sometimes associated with it, and possibly in the relation of predisposing cause. The scrofulous diathesis is thought to favour its production. It occurs most frequently in young adults, though old age is not exempt. Local irritation, and whatever induces an habitual flow of blood to the face, have been supposed to act as exciting causes. Hence, the disease has sometimes been ascribed to cosmetics; and persons whose faces are necessarily much exposed to the fire, as cooks, smiths, &c., are said to be peculiarly prone to it. Some ascribe attacks of it occasionally to the use of a razor previously used in shaving a diseased person. M. Foville saw a number of the insane inmates of the hospital of Rouen attacked by it successively, after having been shaved by the same razor. In the present state of our knowledge, it may be considered most probable that, in its ordinary and characteristic form, sycosis arises from the sporules of one of the plants already mentioned, finding access to the hair follicles, being transferred from the faces of other persons, or deposited from the atmosphere in which they may be floating. The sporules become developed into plants, which multiply through their seed, until all the follicles are occupied. Whatever other causes may appear to produce the affection probably act, either by putting the follicles into a favourable condition for the reception and growth of the plants, or by exciting the irritation produced by the fungus, more speedily than would otherwise happen, into inflammation. Yet it cannot be denied that the follicles may be inflamed without the specific cause, and thus give rise to a form of genuine acne.

Diagnosis.—This affection may be confounded with ecthyma, impetigo figurata, and some forms of syphilitic eruption. *Ecthyma* has larger pustules, and larger, thicker, and more adhesive scabs; and is not attended with tubercules, nor with subcutaneous thickening or induration. In *impetigo figurata*, the pustules are small, flat, in crowded groups, and at their height on the third or fourth day; while those of sycosis are prominent, often pointed, generally distinct, and do not break till the sixth or seventh day. In the former disease there is more fluid discharge, and larger, thicker, and yellower scabs than in the latter. Impetigo is without tubercules. The *syphilitic* pustules are without the heat and pain of those of sycosis, are also flatter, slower in their march, surrounded by a copper-coloured border, and situated in other portions of the face besides the hairy parts.

Bazin, followed by Dr. Anderson (*Med. Times and Gaz.*, Jan. 1861, p. 7), considers this affection as identical with *Tinea tonsurans*, basing his belief upon the facts that the same parasite is found in both, that the two affections often exist together, and that one is capable of imparting the other by contagion. But the symptoms of the two affections are so different, that stronger evidence is, I think, required than any yet adduced to prove their identity; and the facts upon which the opinion is founded are readily explicable by the occasional intermixture of the *Tricophyton tonsurans*, the peculiar parasite of *Tinea tonsurans*, with the one characteristic of sycosis originally discovered by Gruby.

Treatment.—It is important to attend to the state of the general health, and to correct it by measures corresponding with the indications. The habits and pursuits of the patient should be regulated so that they may not act as predisposing causes of the disease. Bleeding may be employed both generally and locally, when there is much inflammation, and the patient is robust. Moderate purging, continued for a long time, at such intervals as not to debilitate the patient, is recommended; and the blue mass or calomel in small doses, followed by or connected with one of the saline cathartics, may be employed for the purpose.

In chronic cases, tonics are occasionally useful, especially the preparations of iron. M. Biett has employed the chloride of gold, with great asserted advantage, by rubbing it upon the tongue. Mercury and iodine may be used as alteratives; and, in very obstinate cases, a careful trial may be made of Donovan's solution.

The patient should avoid the use of the razor, and should remove his beard by means of a very sharp curved pair of scissors. Plumbe recommends that every tubercule should be opened in its advanced state, and the hair plucked from every pustule when it can be done without pain. Bazin and Anderson advise, as the most important remedy, the extraction of all the hairs, by means of a forceps or otherwise. As the parasite finds lodgment in their roots, it is impossible to cure the complaint effectually without their removal. This sometimes happens spontaneously through the process of suppuration, which is supposed also to destroy the parasite itself. The extraction of the hairs is somewhat difficult and painful in the early stage, as their roots are then adhesive, and they are apt to break in consequence of their morbid brittleness; but after suppuration they are easily withdrawn, and it is surprising sometimes to see how rapidly a cure takes place on the removal of the cause.

A great number of local remedies have been proposed, such as have been mentioned under the head of acne. (See *page* 475.) But the most effectual are probably those calculated to destroy the cryptogamous growth in the hair follicles; and the measures referred to may be considered as subsidiary to this end. Should the parts be covered with scabs, or the inflammation be considerable, the former should be removed, and the latter relieved, by means of warm fomentations or poultices, before the remedies are applied. When there is inflammation with excoriation, Goulard's cerate has appeared to me to be useful. A watery solution of sulphurous acid, or an acetous solution of one of the sulphites, may now be tried. A solution of corrosive sublimate in the proportion of from two to eight grains to the fluidounce has been recommended as one of the most effectual measures. The ointments of iodide of sulphur and of nitrate of mercury have been found useful; and I should place some confidence, in the absence of acute inflammatory symptoms, in tar ointment, which I believe to be noxious to fungous life. Benzole has also been strongly urged as a remedy on the same ground; and creasote is said also to be very efficacious as a parasiticide.

III. PORRIGO, OR FAVUS.

Syn.—*Scald-head.*—*Tinea capitis.*—*Tinea favosa* (Bazin).

THIS is a peculiar cryptogamous affection, characterized by scab-like, cup-shaped elevations, distinct or confluent, and of a contagious nature.[*] It was at one time considered as a pustular eruption, and was described as such in the earlier editions of this work. At present, however, it is universally admitted that, though pustules occasionally accompany it, they are merely accidental, and the proper disease has no essential connection with them. Willan, and after him Bateman, confounded under the title of porrigo several distinct affections, having no affinity for each other. Besides the disease here referred to, they describe varieties of impetigo, eczema, and pityriasis, under the names *Porrigo favosa*, *P. larvalis*, and *P. furfurans*. Later dermatologists have corrected this arrangement, and, referring the non-contagious affections to other classes, restrict the term porrigo to the disease now under consideration. Of this Biett makes two varieties, which differ only in the arrangement of the eruption; namely, *Porrigo favosa*, in which the scabs are distinct and without any regular grouping, and *Porrigo scutulata*, which appears in somewhat circular patches. The eruption is precisely the same in both.

1. *Porrigo favosa.*—*Favus dispersus* (Rayer).—*Porrigo lupinosa* (Willan).—This is the most common form of scald-head. The eruption occurs much more frequently on the scalp than elsewhere; but it occasionally appears also on other parts of the body, as the face, neck, limbs, &c., to which it is probably in general transferred, either from the head by the nails of the patient, or from some extraneous source by direct contact.

It shows itself first in the form of specs, of a sulphur-yellow colour, like minute crusts, scarcely rising above the surface, and appearing as if set in the skin. There is usually but little redness about them. They are scattered irregularly, without any special arrangement, and not unfrequently continue permanently distinct; but sometimes they are so crowded as to cover portions of the surface continuously. Very generally they are seated at the root of the hairs, one of which passes through the centre of the crust. The eruption is attended with more or less itching.

When one of these crusts is examined by the microscope, it is seen to be depressed in the centre, or cup-shaped. They gradually enlarge, sometimes to the diameter of five or six lines or more, still retaining the circular form and central depression, which are now obvious to the eye, and constitute one of the striking features of the case. With this increase in diameter they also become thicker, and gradually rise more and more above the surface of the skin, until they are sometimes at length very prominent. The slight redness at first surrounding the eruption spreads and becomes deeper, in consequence of increased irritation of the skin.

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[*] The *favus* of Willan, which he described as a pustule, is undoubtedly the same affection as the cryptogamous crust described in the text, in its earliest stage, and is in no degree pustular.

When the crusts are numerous, they often meet at their circumference, so as to form a continuous incrustation of greater or less extent. In such cases, their rounded circumference is pressed into a somewhat hexagonal shape; and, the cup-like depression in the several crusts remaining, the surface presents an appearance somewhat analogous to that of the honeycomb, which has given origin to the name of *favus*. Sometimes the scabs are so much broken up on the surface as to lose their peculiar aspect; in which case, by removing the superficial parts of the incrustation, the characteristic form often again becomes obvious. The portions of the scalp not affected frequently exhibit a furfuraceous desquamation; and ecthymatous or impetiginous pustules occasionally form, arising from the irritation of the surface, and are mingled with the proper eruption. Sometimes the whole scalp is covered, as by a closely fitting cap.

If permitted to remain undisturbed, the crusts continue to adhere for months or years, but undergo a kind of disintegration on the surface, exchanging their yellow for a whitish colour, becoming brittle, and breaking into small powdery fragments, compared to the crumbling mortar falling from old walls. In the isolated eruption this change begins in the centre, and gradually approaches the edges, which break down, so as to change the concave for a convex surface. The crusts have now entirely lost their characteristic shape. A partial separation of them often takes place spontaneously, after which a new eruption is developed, and new incrustations form.

The hair upon the diseased surface, in this advanced stage, generally falls; and either none afterwards appears, or that which is produced is of an altered character, being downy and destitute of colour.

When want of cleanliness co-operates with the disease, insects are often generated beneath the crusts, intense itching is induced, and the patient is unable to resist his propensity to scratch the parts, sometimes even violently, thus tearing off the scabs, causing here and there bleeding and excoriated spots, and adding greatly to the inflammation. In this state of the scalp, there is usually an extremely fetid odour, said to resemble that of the urine of cats. With proper cleanliness, and upon the removal of the scabs, the odour is less disagreeable, but still stale and nauseous. (*Cazenave* and *Schedel.*)

When, in the earlier stages, the crusts are carefully removed, nothing is seen but smooth concave depressions, somewhat red, but without abrasion. In the worst cases, such as above described, after removal of the incrustation by poultices, or other emollient applications, the surface appears full of small excoriated or ulcerated depressions, which sometimes give it a reticulated appearance, and in very old cases occasionally penetrate to the periosteum, or even to the bone, which may become carious. From these spots a fetid, ichorous discharge takes place, which concretes into irregular scabs, altogether unlike the genuine cup-shaped favous crusts. These are never reproduced except by the occurrence of a new eruption, which runs through its regular course. This not unfrequently happens.

Along with the proper eruption, small subcutaneous abscesses occasionally form in the scalp; and the cervical glands are not unfrequently swollen and somewhat painful. The disease, when long established, is thought to retard the development of the system, and to have a debilitating effect upon the intellectual faculties. A tendency to scrofulous disease is also occasionally shown; and its development is favoured by the eruptive affection. The nails, in old cases, are said to be sometimes thickened, elongated, and roughened, and to become of a yellow colour. (*Rayer.*)*

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* *Favus Unguium.—Favus of the Nails.*—M. Bazin considers this affection of the nails as a distinct variety of Favus, as it occurs sometimes, though very rarely, as an original affection, being probably derived from contact of the fingers with the disease of the scalp

The duration of the complaint, if left to itself, is indefinite. It may continue for many years, a source of much distress to the patient, and of disgust to those about him; but it is seldom if ever directly fatal. When it ends favourably, under proper treatment, new crusts are no longer formed upon the removal of the old, pustules cease to show themselves, and the skin, though it may have been apparently disorganized, returns gradually to its normal state, with only some redness left, which ultimately disappears. The hair, however, is in some instances never reproduced, and, when it comes forth, has usually for a long time an unnatural appearance. Still, this also in time may be perfectly restored, and generally is so, when an early cure is effected.

2. *Porrigo scutulata* (Biett).—*Favus confertus* (Rayer).—*Ring-worm of the scalp.*—This variety also chiefly affects the scalp, though sometimes found on the forehead, face, neck, and other parts of the body. The character and progress of the crusts are precisely as in the preceding variety; but, instead of being disseminated, they cluster into circular patches. At first a small red surface may be seen, upon which the minute crusts appear, thickly crowded, especially near the circumference, where they are most abundant. These soon exhibit the characteristic cup-shaped summit; and, upon their removal, the surface appears red and shining, and is soon covered with a new eruption. The patches extend by the formation of additional crusts at their circumference, and at length not unfrequently meet, and become confounded together over a greater or less extent of the surface. Sometimes the whole scalp is covered with a thick crust, and almost entirely deprived of hair, except a narrow border at its confines. Still the peculiar character of the variety may be known by the arcs of circles which appear at the circumference of the incrustation. In the middle, the several circles are completely confused, and the crusts have lost their peculiar colour and shape, being whitish, brittle, and crumbly, and presenting the appearance of old mortar, referred to as occurring in the former variety.

When the clusters are numerous, and have not yet coalesced, they may appear in different parts of the scalp in all their different stages; the incipient circle of redness, the group of yellow specks, the scabby incrustation, and the final white and hairless patch. In the disposition to indefinite duration, and in the results of efficient treatment, this variety resembles the former; and it is probably identical with it in nature.

Causes.—Both varieties of porrigo are undoubtedly contagious; being caused by the direct contact of the morbid product. It has, indeed, been imparted by inoculation. A very common mode of propagation is the employment of a comb, which has been used for the hair of a diseased individual. The complaint is said also to arise sometimes without contagion. Persons of feeble constitution, of a lymphatic temperament, badly fed and clothed, with filthy habits, and confined to low and damp places, as in prisons, are thought to be peculiarly liable to it; but it occurs also in others in a perfect

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in other persons. Its source in those with the disease in its ordinary form is very obvious. The favous spores are introduced beneath the nail, probably in consequence of a solution of continuity of the skin accidentally existing at the time, germinate there, and partially separate the nail, which thickens, assumes a yellowish colour, becomes fissured, and is at length perforated, when a favous cup shows itself, though more or less deformed by the pressure to which it has been exposed.

Favus of the Epidermis.—This is another variety of favus, first noticed by Dr. Anderson, among the British dermatologists. He has seen it, however, only as a complication of the disease affecting the hair follicles. It is quite different in aspect from the latter form. A slight redness of the epidermis is followed by a thin scaly crust, sometimes resembling a spot of pityriasis, but still more frequently a crust of eczema. The patches are small, scattered, and white with yellow streaks; the white portions consisting of epidermic scales; the yellow of the favous matter, which is seen abundantly under the microscope. (*Med. T. & Gaz.*, Feb. 1861, p. 172.)—*Note to the sixth edition.*

state of the general health; and the greater apparent liability of the former may very probably be ascribed to their greater exposure to the cause. No age and neither sex is exempt, but children between the ages of six and ten are most frequently affected. Some persons appear to be insusceptible to it, and escape, though the contagious cause may be directly applied to them.

Nature.—Most authors seem to agree with M. Baudelocque in the belief, that the disease is seated in the hair follicles. Within a few years, it has been ascertained that the peculiar crusts of porrigo have a vital organization. To Schönlein, of Berlin, is due the credit of having first detected in them a peculiar microscopic fungus, named in honour of its discoverer, *Achorion* or *Oïdium Schönleini*. His observations have been confirmed and extended by others, among whom may be mentioned Gruby, Bennett, and Lebert. When the favous crust is removed, and examined before it has become disintegrated, it is perceived to consist of a cup-shaped capsule, concave at top, convex at bottom, having a cavity within, and composed of epidermic scales. The interior surface of the walls is covered with a finely granular mass, from which sprout countless cylindrical tubes, branching dichotomously, and terminating in round or oval globules, of which several are often arranged together like a row of beads. These tubes are jointed at regular distances, and frequently contain minute granules. The central portion of the capsule is filled with masses of spherical or oval corpuscles, mingled with fragments of the tubes, and more or less of the granular or molecular matter noticed on the inner surface. The branching tubes are the plant, and the corpuscles are thought to be the sporules, formed and thrown off at their extremities. May not these supposed sporules be, as suggested by Dr. Griffith (*Lond. Med. Gaz.*, Feb. 1851, p. 275), merely the smaller joints of the fungus produced by germination; and the molecular granules found among them be real sporules, as conjectured by Lebert (*Physiol. Pathol.*, p. 480)? In this way all the constituents of the capsules may be accounted for; the walls being composed of the epidermic scales, while the contents are altogether products of the parasitic growth.

The hairs passing through the capsules are stated by Dr. Bennett to contain the same jointed tubes, which run through them longitudinally, and render them very brittle. (*Monthly Journ. of Med. Sci.*, July, 1850, p. 51.) As the hair follicle is much more deeply seated than the favous crust, it may probably remain unaffected by the disease; so that, though the hair is destroyed by it for a time, it may in the end be regenerated. Lebert observed, attached to the hair in the seat of the disease, minute brownish bodies, round, pear-shaped, or irregularly elongated, and filled with granules, which he conjectures to be very young receptacles of the true favous plant.

It is asserted that other cryptogamic genera have been found in different varieties of favus; and M. Hulin has noticed in the crusts plants belonging to both *Puccinia* and *Isaria*. (*Arch. Gén.*, Mai, 1856, p. 613.)

It is probable that the disease is propagated by the transplantation of the sporules of the plant, which, arrested at the entrance of the hair follicles, are detained in this situation, and, propagating, penetrate the epidermis, and make themselves a nest of its scales. When the epidermis is abraded, the same sporules may probably find access into it in any situation; so that the disease is not essentially connected with the hair follicles. That these are not otherwise interested than as just stated would seem to result from the fact, that the favous crust, when removed, leaves only a superficial depression in the skin, without abrasion, which soon rises to the general level, and shows no appearance of disease. Some experiments of M. Bazin have rendered it highly probable that absolute contact with the disease in others is not essential to its propagation; for he has shown that the spores of the achorion may be conveyed in a current of air to the distance of at least 50 centimetres (about 20 inches) from the patient. (*Am. J. of Med. Sci.*, April, 1865, p. 499.)

Dr. Bennett thinks that a scrofulous condition of system, or some analogous depravation of health, is necessary to the propagation of the disease, and that the finely granular matter in the capsules is a product analogous to the granules of tubercles, and serves as a soil for the fungus to take root in. But though, in the cases noticed by that author, such a defect of constitution existed, it is by no means so generally observable in the cases which appear among us, and Lebert states that the disease occurs as well in healthy as unhealthy children.

Diagnosis.—There is generally little difficulty in distinguishing this from all other diseases, upon a close examination. The complaint with which it is most likely to be confounded is impetigo. But the somewhat prominent form of the pustule in that affection, its inflamed base, the frequent liquid exudation, the comparative thickness, softness, and looseness of the scab, the continuance of the hair even in the advanced stages, and the utter want of contagious properties, will in general be sufficient to distinguish it from porrigo; which is characterized by its flat crust, set as it were in the skin, with little redness at the base, its cup-shaped surface differing from that of all other eruptive diseases, the white powdery appearance of its last stages, the loss of hair which attends it, and its contagiousness. The circular form of the patches of *porrigo scutulata* gives this variety a superficial resemblance to various affections of the scalp having the same form, as impetigo figurata, herpes circinatus, and lichen circumscriptus; but a close examination of their elements cannot but lead to a correct diagnosis.

Treatment.—It is always proper to attend to the condition of the general health in this complaint; but rather in order to prevent evil from the removal of an inveterate disease, to which the constitution may have become habituated, than with a view to its cure. A blister, issue, or seton in the arm, which has been recommended in obstinate porrigo, may be useful in this way. Should evidences of a scrofulous state of system be presented, cod-liver oil should be exhibited, with or without the preparations of iron or iodine, as the symptoms may or may not call for these medicines. But no remedy not directly addressed to the part, can have any material effect in the cure of the eruption, the treatment of which must be mainly local.

If the disease occupy the scalp, the hair should first be removed from the affected part by cutting it closely with a pair of scissors, or by shaving it. The scabs should then be removed by means of emollient poultices or fomentations, and thorough washing with soap and water; and, throughout the treatment, attention should be sedulously directed to the keeping of the surface clear from incrustation. One cause of the aggravation of the complaint is thus removed, and access allowed for the remedies to the seat of the disease, without which they can be of little avail. The next step is to apply substances capable of subverting the morbid action in the part, or destroying the microscopic fungus on which it probably depends.

Should the disease be in its early stage, and confined to narrow limits, it may be proper to attempt to arrest it at once by the application of nitrate of silver, in stick, or saturated solution. This plan will often prove effectual; and a single application is generally sufficient. But the remedy may be thought too severe for the occasion, and is not adapted to cases which have acquired any considerable extent.

Judging from the cases which have fallen under my observation, I should be disposed, in all instances, whether in the early or advanced stages, to make a thorough trial of tar ointment, after having obtained a clear surface. This often acts very happily, and of itself effects cures. It should be kept applied to the part steadily for a long time. I believe that the pitch caps which were formerly recommended, in order to extract the hair by their removal, operated more in the relief of the disease by their alterative than their mechanical influence. Should the tar ointment fail when applied alone, it may be mixed with an equal proportion of sulphur ointment. Should this mixture also fail, recourse may be had to the ointment of iodide of sulphur, as recommended by Biett, or to some one of the numerous remedies mentioned in the books, which may be employed successively, if necessary, until the disease gives way. The excessive pertinacity of the complaint renders it desirable to have a long list of remedies at command. Those deemed the most effectual are enumerated below.

Much stress is laid by some writers upon the necessity of extracting the hairs. This is readily understood, when it is recollected that the hair often contains the plant, and consequently serves to propagate it to the neighbouring epidermis, though the whole of the disease within reach of the remedy applied may have been destroyed. Rayer says that "in old cases of favus of the scalp, any method of treatment into which the evulsion of the hair does not enter as an element is incomplete, and not worthy to be entitled curative." The old plan of effecting this by means of adhesive caps has been abandoned as barbarous. The object may be effected by removing the hairs one by one with a pair of tweezers. But a much more rapid plan is to employ a *depilatory* application; and the carbonate of potassa or of soda is said to answer this purpose, while it exercises a favourable influence directly on the disease. Either of these may be used in the form of an ointment made by mixing one or two drachms with an ounce of lard. This should be rubbed upon the part every day for six or eight minutes; and at the same time a wash may be used, containing two drachms of either salt in a pint of water.

The hairs having been removed by this, or some other method, if the disease has not given way, one of the following substances may be applied twice daily; namely, in the form of lotion, the mineral acids in the proportion of a drachm to a pint of water, and solutions of sulphuret of potassium, chloride of lime, sulphate of iron, zinc, or copper, nitrate of silver, and bichloride of mercury; in the way of inunction, ointments of nitrate of mercury, red oxide of mercury, dried alum, calomel, oxide of manganese, cocculus indicus, white hellebore, and cantharides. Dr. Bennett makes use of cod-liver oil as a local as well as a general remedy.

The ointment of nitrate of mercury (citrine ointment) is probably among the most efficient. Mr. Startin has obtained great success with a compound sulphur ointment, consisting of sulphur, ammoniated mercury, ethiops mineral, and creasote, with lard and olive oil. (See *Med. Examiner*, N. S., x. 445.) Some have recommended a blister to be applied over the diseased part, and it sometimes appears to have done good. Dr. Wigan speaks with the utmost confidence of the efficiency of concentrated acetic acid. He applies the acid for three or four minutes to the diseased spot by means of a fine sponge, tied to the end of a stick, or in a pair of silver sugar-tongs. One application, he says, is sufficient to effect a cure. Cauterization with nitrate of silver, or the strong mineral acids, may be employed as a last resort in the advanced stages. Dr. Wm. Jenner has found a strong solution of sulphurous acid very efficient, having employed it as a poison to the parasitic fungus. (*Lond. Med. Times and Gaz.*, vii. 183.) Naphtha has been recommended. The oil of cade, used in France, is essentially the same in its effects as our common tar. Dr. H. G. Carey, of Dayton, Ohio, has found very effective the decoction of poke-root (phytolacca decandra), applied by means of cloths saturated with it, after the cleaning off of the scabs; the dressing being covered with an oiled silk cap. (*St. Louis Med. and Surg. Journ.*, Sept. 1856, p. 464.)

IV. TRICHOSIS.

This name was employed by Dr. Good to express disease of the hair. It is here applied to two affections, ranked by Willan with porrigo, but consisting essentially of an abnormal state of the hair, producing baldness in the part attacked, and dependent probably upon a parasitic fungus.*

1. *Trichosis furfuracea* (Erasmus Wilson).—*Porrigo scutulata* (Willan).—*Herpès tonsurant* (Cazenave).—*Teigne tondante* (Mahon).—*Tinea tonsurans* (Bazin).—*Ring-worm of the Scalp.*—This affection is seated in the hairy part of the scalp. It consists of one or more circular patches, generally covered with minute furfuraceous scales, and exhibiting the remains of hairs, which rise usually a line or somewhat more above the skin, though of very unequal length, and are ragged at their ends as if eaten off by an insect.

According to Willan, the surface about to become the seat of the disease is first covered with very small pustules, which afterwards break and form minute scabs, followed by a furfuraceous exfoliation. Cazenave maintains that the affection commences with little vesicles, which advance at the circumference of the patch, and are followed by a desquamation occupying the centre. Hence, he considers it a species of herpes, and is confirmed in his views by the occurrence, in the greater number of cases, of patches of herpes circinatus on the neck and forehead. Erasmus Wilson says that there is first a layer of scurf, consisting of separate scales around each hair, or patches including several hairs. The probability is, that the visible disease begins sometimes in one of these methods, sometimes in another; as the cutaneous affection is the mere result of an irritation extended from the diseased hair, which, according to its degree, or the peculiar susceptibility of the individual, may occasion a vesicular or a pustular eruption, or a mere exfoliation of epidermic scales. The only characteristic appearances are the dry furfuraceous surface from which the finger nail easily separates a fine powder, little papillary elevations about the hair follicles sensible to the sight and touch, and the broken irregular stumps of the hair, which are variously bent or twisted, and have a tow-like aspect.

In old and neglected cases, the incrustation becomes thicker, and appears broken up into small angular portions, separated by white lines. Sometimes impetiginous pustules result from the irritation of the skin; but they are not essential attendants on the disease.

The circular patches may occupy any part of the scalp, but are said to be most common upon the side of the head and the occiput. Their size varies from a few lines to that of a silver dollar, and increases with the duration of the complaint, until, by the confluence of neighbouring circles, they sometimes cover nearly the whole scalp, leaving only a narrow fringe of uninjured hair around the head.

The only complaint with which this could be confounded is pityriasis, from which it is readily distinguished by the perfect state of the hair in the latter.

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* A third form of Trichosis, dependent on a special hair-fungus, has been described by Dr. Aloys Martin, of Munich, as having occurred in two female children under his care. It appeared in patches, in which the hair had first assumed a golden or orange colour, and had the appearance as if covered with a yellowish-red ointment, which adhered to it in small masses. In a more advanced stage, the hair had dropped out, or broken off, leaving short stumps, looking as if they had been singed; and around the spot thus affected were lying remnants of hair of the same colour, in the form of powder. Examined under the microscope, the colouring matter appeared to consist of a structureless substance, containing numerous extremely minute cells, situated in the hair underneath the cuticle. This was a peculiar fungus, which received from Dr. Buhl, who examined it, the name of *Zooglœa capillosum*. It was cured by simply washing with soap and water, but not till after the treatment had been continued for several months. (*B. & F. Medico-chir. Rev.*, April, 1863, p. 527.)—*Note to the sixth edition.*

It is without danger, but is extremely obstinate, lasting for months, and sometimes for years, and, if left to itself, may end in complete and incurable baldness. But, if properly managed, it may be entirely removed; and the hair may grow again of its natural texture.

Nature and Cause.—This complaint probably depends essentially upon a cryptogamous growth in the interior of the hair. When examined microscopically, each hair is found to be much thickened, and to contain, immediately beneath its outer cortical portion, a layer of nucleated cells, and, within these, longitudinal filaments, undulated in their course, and interrupted here and there by the nucleated cells, which are also distributed between them. Gruby considers these cells and filaments as a cryptogamous growth, capable of propagation. The fungus has been named *Tricophyton furfurans*, or *T. tonsurans.* Upon this view, the contagious character of the complaint, almost universally admitted, can be readily understood. The sporules may be conveyed by means of combs, towels, hats, &c. from the head of one person to that of another. Bateman says that the disease seems to originate spontaneously in ill-fed and uncleanly children, of feeble health, and is afterwards propagated by contagion; but it appears to me that, if its dependence on a peculiar vegetable parasite be admitted, the probability is altogether in favour of its exclusive origin in that cause, though filthy habits and depraved health may facilitate its transfer and propagation. M. Reynal has shown that this affection sometimes occurs in the horse and the ox, and may be transferred from them to man. (*Arch. Gén.*, Fév. 1858, p. 237.) The disease occurs chiefly if not exclusively in children.

Treatment.—The general state of health should be attended to, and corrected if in any way impaired. Particular attention should be paid to hygienic circumstances, such as cleanliness, proper clothing, wholesome diet, and exercise in the fresh air. The mineral acids, chalybeates, or vegetable tonics may be given in cases attended with debility, and cod-liver oil in those exhibiting a scrofulous habit. But local measures are most important. These are essentially the same as those directed for porrigo. The part should first be deprived of its scaly coating by washing with soap and water, and then rubbing with a towel, or by the application of some stimulating liquid, such as vinegar or tincture of cantharides; and should afterwards be treated with some ointment or wash, which may alter the nature of the diseased action, or destroy the vegetable parasite. Probably no one is more efficient for this purpose than tar ointment, which should be applied at first diluted with lard or suet, and, when the skin ceases to be irritated by it, of the full strength. It should be kept in constant contact with the patches, except when the head is washed with soap and water, which should be done once at least every day. Should this fail, other applications may be tried, as ointments of nitrate of mercury, red oxide of mercury, ammoniated mercury, iodide of sulphur, and sulphate of zinc, or solutions of the last-mentioned salt, sulphate of copper, and corrosive sublimate. Solution of sulphurous acid may be tried, as peculiarly noxious to cryptogamous vegetation. Each of these substances should at first be used weak, and its strength gradually increased; and the application may be made twice a day, the ointment being well rubbed in each time. If the part be too much irritated, it may be dressed with cerate of subacetate of lead. The hairs should be removed if possible, or should be kept closely cut down to the scalp.

2. *Trichosis decalvans* (Willis).—*Porrigo decalvans* (Willan).—*Tinea decalvans* (Bazin).—*Alopecia circumscripta.*—*Alopecia areata* (Anderson).—This consists of patches of baldness more or less circular, without any essential eruption on the surface. The portion of the scalp affected is smooth, shining, remarkably white, and quite hairless, while all around it the hair is perfect. At certain stages of the complaint, small papulous elevations of the

skin appear at the openings of the hair follicles. The circles gradually enlarge, sometimes become confluent, and may at length denude almost the whole scalp. The affection is of considerable duration, but gradually subsides, and may be followed by a new crop of hair, which is softer and lighter-coloured than before, and, in persons somewhat advanced in life, is apt to be gray. Sometimes, however, permanent baldness results. Besides the scalp, other hairy parts, as the face and pubes, are liable to be attacked.

Gruby found in the hair which falls in these cases a microscopic fungus, seated in the epidermis of the root, branching, with sporules on its sides, forming a sort of sheath about the hair, and at last penetrating into the neighbouring epidermis. (*Arch. Gén.*, 4e *sér.*, xxiv. 341.) The name of *Microsporon Adouini* has been given to the fungus. When the hair is quite destroyed, and lost from the part affected, the parasite ceases to find the circumstances essential to its support, and, in all probability, gradually perishes. Mr. Jonathan Hutchinson, however, who has carefully examined numerous cases, has been unable to detect any parasitic fungus whatever (*Med. Times and Gaz.*, Feb. 1855, p. 218); and the same statement is made by Dr. Wm. Jenner (*Ibid.*, Dec. 1857, p. 650). Mr. Hutchinson finds the only anatomical characters to be wasting of the hair-bulb, and thinning of the affected part of the scalp. Whether this affection is propagated by contagion has not been determined. Bateman states that it has appeared where no communication could be traced. They who believe it to be a cryptogamic affection, consider it contagious. Mr. Hutchinson denies altogether its contagious character, and ascribes it to a constitutional cause, which, however, he does not pretend to define. It is not confined to any age; but is most frequent in children.

Supposing the disease to depend on a parasitic fungus, the treatment should consist in the application of one or more of the substances mentioned as useful in the preceding form of trichosis. Washing with soap and water, and rubbing with a towel, may have the effect of rendering the epidermis penetrable, and of thus bringing the remedy into contact with the remains of the fungus about the follicle. The application may also be useful by stimulating the atrophied follicle itself. When the hair begins to reappear, if the patch be frequently shaved, and some excitant liniment or lotion applied, it will gradually resume its original quality. The most effective local remedies are such as prove efficacious in other vegetable parasites, especially applications of a terebinthinate character. Liniments made from tar, creasote, Canada turpentine, oil of turpentine, &c. may be employed. A more agreeable preparation may be made by dissolving two fluidrachms of the oil of cloves or of nutmeg in four fluidounces of alcohol, with or without a little camphor. Dr. Wm. Jenner has found a saturated solution of sulphurous acid very efficient. It is applied by means of a piece of linen, which should be wetted several times a day, and covered with an oil-skin cap. Tincture of iodine is recommended when the patches are small; and blisters may be resorted to if less powerful remedies fail. Dr. James Watson, of Edinburgh, has used successfully in a very bad case, in which the whole scalp was involved, carbolic acid dissolved in twenty-four parts of glycerin, applied night and morning, and prevented from evaporating by a cap of oiled-silk. Before each application, the parts were washed with black soap and water. After some months of treatment, the disease was completely cured, and the head furnished with a full crop of glossy silken hair, of a yellowish tinge. (*Ed. Med. Journ.*, Sept. 1864, p. 236.) Constitutional measures should not be neglected, and, when the health is feeble, chalybeates, bitter tonics, and cod-liver oil may be employed. It is sometimes necessary to continue the treatment for several months. Dr. Anderson recommends that, in order to prevent the extension of the disease, the hairs for a short distance around the affected part should be extracted, and that the head should be washed daily with black soap. The downy hairs which may form on the diseased surface are also to be eradicated if possible. (*Med. Times and Gaz.*, March, 1861, p. 298.)*

Article IX.

UNCLASSIFIED SKIN DISEASES.

I. ELEPHANTIASIS OF THE ARABIANS.

Syn.—*Barbadoes Leg.*

In the earlier editions of the present work, this complaint was, for the sake of convenience, ranked with the Greek elephantiasis, with which, however, it has nothing in common but the name. Being quite peculiar in its character, it obviously belongs to the group of unclassified affections.

The elephantiasis of the Arabians is a chronic indurated swelling of the subcutaneous tissues; with more or less alteration of the skin itself, and great deformity of the part affected.

It occurs most frequently in the lower extremities, especially in the leg above the ankle; and the enormous size which the limb sometimes acquires has no doubt given rise to the name of the disease. The next most frequent seat of it is probably the scrotum. Dr. G. R. B. Horner, in his description of the disease as it prevails in Rio Janeiro, states that it occurs almost as often in the scrotum as the leg. (*Med. Topog. of Brazil*, p. 107.) The arms are also occasionally attacked; as, in fact, are most other parts of the body, among which may be particularly mentioned the face, neck, female breast, and anterior part of the abdominal parietes.

Symptoms.—As described by Dr. Hendy and M. Alard, the disease appears usually to begin with acute inflammation of the lymphatic vessels. Pain is felt in the part, and, when the complaint occurs in the leg, a hard knotty cord runs up from the ankle or knee, along the course of the absorbents, to the groin, where it terminates in the swollen glands. At the same time, there is frequently erysipelatous inflammation of the surface, with more or less subcutaneous swelling. These local symptoms are attended with fever, headache, sometimes delirium, and frequently vomiting. After a few days the attack subsides, and goes off entirely with the exception of a slight tumefaction in the limb. But, after a length of time varying from a month to several years, the attack is renewed; and the paroxysms, being frequently repeated, and on each occasion leaving more and more of the swelling behind, produce at last the enormous tumefaction characteristic of the disease. In some instances, there is little or no fever, and the swelling gradually increases, with less pain and inflammation than in the febrile cases.

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* *Mycetoma.*—This name has been given by Dr. H. C. Carter, Assistant Surgeon in the Bombay Army, to a peculiar parasitic affection, widely prevalent in India, though not recognized elsewhere. It attacks the feet or hands, particularly the former, and is apt to occur in the sole. It begins as a small, flattened tumour, firm to the touch, little painful, and of slow growth. After some months the cuticle is raised into a sort of bleb or blister, from which, on its opening, fungous particles escape. Sinuses are now formed, from which the fungous matter continues to be discharged; the original tumour enlarges and others appear; and at length the whole foot or hand becomes much swollen, of a dark colour, and studded with sinuses. From these great quantities of fungous sporules are constantly escaping; and the disease appears to go on indefinitely unless artificially relieved. The only remedy, hitherto successful, has been amputation of all the affected parts; though it seems to me that a careful and diligent application of the parasiticide remedies, by injections into the sinuses and otherwise, ought to be adequate to the cure. Hitherto, it has been seen only among the natives, who go with their feet bare and seldom wash them, and is most frequent among men of the agricultural classes. Dr. Carter gives a particular account of the parasitic fungus, and distinguishes three varieties; but I must content myself with referring to his paper in the *British and Foreign Medico-chirurgical Review* for July, 1868, p. 200. (*Note to the sixth edition.*)

Sometimes the swelling is uniform, sometimes in successive portions, separated from each other by deep furrows. It may be confined to the part originally affected, or may extend to others in the neighbourhood. The only parts of the limbs which escape are the palms of the hands and soles of the feet. In some instances, the skin is white, smooth, and tense; in others, variously altered, exhibiting prominent veins and varicose tumours upon the surface which give it a violaceous hue, or pouring out a liquid exudation which concretes into scabs, or covering itself with scales as in ichthyosis, or finally deformed by fissures, ulcers, or soft fungous excrescences. The sensibility of the surface is not lost in this, as in the other form of elephantiasis. Tumours sometimes form in the affected part, and the lymphatic glands corresponding with it are chronically enlarged. (*Duchassaing.*) Occasionally the glands suppurate, or portions of the limb slough, and discharges of fetid pus contribute to exhaust the patient. The complaint is said sometimes to end spontaneously in health; it often continues for many years in an indolent state; but finally, if not carried off by some supervening disease, the patient is generally worn out, and dies of a low irritative fever.

When the scrotum is affected, the size which it sometimes attains is enormous. Dr. Horner states that he saw two instances in which the tumour was four feet in circumference.

Though, in the disease as above described, the lymphatics appear to be the primary seat, yet cases have been reported by MM. Bouillaud, Rayer, and Fabre, in which the original cause was supposed to be obstruction of the veins leading from the part affected. (Rayer *on Diseases of the Skin.*)

Causes.—Little can be stated positively as to the causes of the disease. It is not contagious; and whether hereditary or not is uncertain, though M. Duchassaing, from observation, believed it occasionally to be so. It attacks all ages, but adults more frequently than children, and seldom originally the old; both sexes indifferently; and persons of different races, and in all situations in life, though more frequently the poor than those in comfortable circumstances. Climate has undoubtedly some influence in producing the disease; as it is almost confined to hot countries. It appears to be peculiarly prevalent in certain districts within the tropics, as in Barbadoes, Rio Janeiro, Ceylon, &c. It seldom originates in cold or temperate latitudes; and M. Duchassaing states that he has known the disease, in patients who have emigrated from the tropical regions of America to the United States, to be arrested, and even disappear. (*Arch. Gén.*, Oct. 1854, p. 418.) Some have ascribed it to sudden changes of temperature. Dr. Horner attributes the disease, as it occurs in Rio Janeiro, to the heat and moisture of the climate, and the exhalations by which the air is contaminated; and, in support of this view, states that it has become less prevalent in that city, since greater attention has been paid to the removal of the sources of foul exhalations. Over-exercise of the limbs, burrowing of insects beneath the skin, blows on a part, and the habitual use of stagnant water have been ranked among the causes.

Dr. Allan Webb has examined the structure of the diseased tissue of elephantiasis, as the disease occurs in India, and has also had some opportunities of investigating the condition of the interior organs. The former he agrees with Mr. Paget in considering a fibro-cellular growth, formed from an exuded albuminous liquid, and mingled with elastic tissue, and more or less fat; the latter he found greatly diseased, the heart being generally affected with fatty degeneration, the liver cirrhosed, enlarged, or fatty, and the spleen and kidneys variously affected, and almost always unhealthy. Fatty degeneration was a prominent condition in most of the great organs; and this is what might have been anticipated, considering the great diversion of nutritive matter to the enlarged structures from the rest of the system. Dr. Webb does not believe that the disease results from inflammation of the lymphatics or veins; but is disposed to consider it as a blood affection, bearing some analogy with rheumatism. (*B. and F. Med.-chirurg. Rev.*, Am. ed., Oct. 1855, p. 413, from *Ind. Ann. of Med. Sci.*) There is little doubt that this variety of elephantiasis is a mere hypertrophy of the normal cutaneous and areolar tissues, without special deposit, or heterologous formation.

Treatment.—Advantage may be hoped from treatment in the earlier stages. The paroxysms should be encountered by bleeding, purging, the antiphlogistic regimen generally, rest, elevation of the limb, and leeching, with emollient applications to the inflamed part. Blisters might be expected to do good in removing the tumefaction left behind by the paroxysms.

In the chronic state of the disease, internal remedies have little effect. They should be employed only so far as they may be proper to meet general indications. Mercury has been tried without benefit. Something might be hoped from the influence of iodine upon absorption. Of local measures, steady compression, the occasional use of the vapour douche for fifteen or twenty minutes, and frictions with the ointment of iodide of potassium promise most fairly. If the surface of the limb be inflamed, it should be treated with emollient cataplasms. A medicine denominated *assacou* has been employed in Brazil, with asserted advantage in this complaint. It is the product of the Hura Brasiliensis; and either the milky juice of the plant, or an infusion or decoction of the bark, is used. (See *U. S. Dispensatory*, 9th ed., or later.) The alterative medicines mentioned under Elephantiasis of the Greeks may also be tried. (See *page* 491.) Dr. H. D. Bulkley, of New York, in a note to his edition of Cazenave and Schedel's work on diseases of the skin (A.D. 1852, *page* 384), states that he has found the local application of the vapour of sulphur and iodine, with iodide of iron internally, successful in a case which had come under his notice. A complete and permanent cure of elephantiasis of the leg was effected by Dr. J. M. Carnochan, of New York, by tying the femoral artery. (*N. Y. Journ. of Med.*, N. S., ix. 168.)

II. PELLAGRA.

Pellagra (from *pellis*, skin, and *ægra*, diseased), though unknown in this country, merits a brief notice from its extensive prevalence and great fatality in certain parts of Europe. It is met with more or less throughout the North of Italy, but abounds most in the lowlands of the Milanese, where it is very destructive. It has been noticed also in the South of France, and in certain parts of Aragon and of the Asturias in Spain; and M. Billod has described a similar disease, which prevails among the insane, in the asylums of Rennes and Angers. (*Arch. Gén.*, Mars, 1858, p. 257.) The existence of the disease in Lombardy can be traced back no further than to the early part of the eighteenth century; and it is generally believed to be of modern origin. It was first described by Frapolli, physician to the hospital of Milan, in a publication which appeared in 1771. The cutaneous affection, in this complaint, is only an accompaniment of the much more serious constitutional derangement, which may, indeed, exist after the disease of the skin has quite disappeared.

Symptoms, Course, &c.—The disease is chronic, generally lasting two or three years, and sometimes much longer. The cutaneous affection usually makes its appearance at the commencement of warm weather in the spring, but is invariably preceded, for a longer or shorter period, by symptoms of disorder of the system. Of these, general uneasiness, feelings of weakness, depression of spirits, an anemic aspect, and various signs of digestive derangement are the most prominent. The occurrence of the eruption in the spring is thought to be determined by exposure to the sun; as it appears especially in the parts of the body which are uncovered, such as the back of the hands, the forearm, the neck and breast, the feet and lower parts of the legs, and sometimes the forehead and cheeks. Patches of a dark, obscure, erythematous redness, sometimes semicircular or elliptical, first show themselves on these parts. In some instances, there is a mere chocolate-coloured darkening of the skin, with subsequent desquamation, and without redness, pain, or itching. In others, the affection approaches the erysipelatous character, with vesicles or blisters, and a burning pain, which, when the surface is no longer exposed to the sun, end in an exfoliation of the cuticle, followed by a smooth, shining, darkened spot, in the place of the original eruption. During the progress of the skin affection, the general symptoms continue; but there is no relation between them in the degree of intensity. The appetite is wanting or morbidly excessive; the bowels are obstinately constipated, or loose with variously unhealthy discharges; the lips are livid, and the mucous membrane of the mouth pale or ulcerated; and all the signs point unmistakably to disorder of the digestive system, and a depraved state of the blood. With the advance of the season a remarkable remission takes place in the symptoms, both general and local, and, at the beginning of autumn, scarcely any traces of the disease remain. This amendment continues, more or less, until the next spring, when the symptoms again make their appearance, and, so far as regards those of a constitutional character, in an aggravated form. Disorder of the nervous system is now superadded, as evinced by disturbances of hearing and vision, headache, spinal pains, cramps, and convulsive movements, muscular weakness amounting almost to palsy, especially in the lower limbs, mental dejection, fearfulness, and sometimes delirium or mania. The disease of the digestive system is aggravated, the general cachexia deepens, and the skin frequently becomes callous and marked with deep fissures. Other diseases often supervene, as various internal inflammations, and tuberculous deposition; and many patients die at this stage. But more generally another remission takes place with the approach of cool weather, though much less decided than on the former occasion. After this the affection becomes again aggravated, fever of a typhoid character often sets in, the debility is extreme, the breath offensive, the functions generally depraved, the senses blunted; and the patient, if he do not die of phthisis, dysentery, or other intercurrent affection, or sink under the prostration of the disease, often becomes maniacal, and is left at last with incurable dementia or idiocy.

Dissection shows various lesions from the intercurrent affections; but nothing of a special character has been noticed, except an extraordinary atrophy of large portions of the small intestines, especially of the ileum, first particularly described by Dr. P. Labus, in a treatise on the disease published at Milan in 1847. (See *Ed. Month. Journ. of Med. Sci.*, Nov. 1851.)

Causes.—It is generally admitted that pellagra is the result of causes calculated to deprave the blood, and depress the powers of the system, such as bad and insufficient food, crowded and ill-ventilated dwellings, inadequate clothing, and mental anxiety and distress, all of which have been operating, with steadily increasing force, upon the wretched and oppressed agricultural population of those rich and beautiful regions where the disease prevails. Special influence has been ascribed to the use of maize as a common article of diet; but that there is nothing unwholesome in this kind of food is proved by the fact, that millions of our own population employ it largely and habitually, without any injurious effect. It is not impossible that the use of Indian corn of a bad quality may contribute to the result; and the opinion of Dr. Balardini, who ascribes the disease mainly to this article of food, altered by the presence of a parasitic fungus, which he names *Sporisorum maidis*, may possibly be correct. In this case, there would be a strong analogy between the occurrence of pellagra, and those fatal prevalences of disease, in certain parts of Europe, which have been attributed to the use of ergotted rye. But in opposition to the origin of this malady in the use of diseased maize, are the asserted facts that, though the pellagra, as occurring in the French asylums, and the Spanish province of Aragon, is absolutely identical with the Italian affection, yet Indian corn could have formed no part of the diet of the patients in the two former positions, as it was carefully excluded from use in the asylums, and is unknown as an article of food in Aragon.*

Treatment.—Little need be said upon this point here. No specific remedy, and no plan of treatment specially applicable to the disease have yet been discovered. Proper hygienic measures, as regards diet, clothing, lodging, &c., have been found effectual in the way of prevention, and have even proved curative, if applied in the earlier stages. In relation to other remedial measures, they are simply such as the symptoms themselves would indicate. Unfortunately they are too often ineffectual, when applied for the first time to the disease already fully established.

SUBSECTION III.

DISEASES OF THE SALIVARY GLANDS AND PANCREAS.

MOST of the diseases of the salivary glands come under the care of the surgeon, and will, therefore, not be noticed in this work. Those which require the attention of the physician may be included under functional derangement and inflammation. The former may consist either in an increase, diminution, or alteration of the secreted fluid; the latter may be of the ordinary character, or specific. The pancreas is so similar in structure and product to the salivary glands, that its diseases may, with propriety, be considered in the same category; and I shall, therefore, treat of them under the present head.

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* Since the year 1858, when the preceding edition of this work was published, much discussion has taken place on the continent of Europe, especially in France, in reference to the nature and cause of pellagra. Though its dependence on a diet of maize affected with a disease called *verdet* (Fr.), or *verderame* (Ital.), in English the *greens*, caused by a cryptogamic parasite, has been strenuously maintained by some, yet the general current of sentiment is, I believe, in the contrary direction; and one of the most recent writers, Dr. E. Billod, physician-in-chief of the Insane Asylum Sainte-Gemmes, near Angers, who has seen much of the disease both in the establishment under his charge, and in the North of Italy, maintains not only that pellagra does not originate in this cause, but that there is no such distinct disease as has been described under that name, which he thinks should be confined exclusively to the erythematous affection of the skin. The following is a summary of M. Billod's conclusions, drawn from his paper on the subject in the *Archives Générales* for March, 1865 (p. 258).

Pellagra, as ordinarily described, presents three orders of symptoms; 1. an erythematous eruption on the skin, 2. disorder of the digestive apparatus, and 3. various nervous derangements, as referred to in the text, including even insanity. According to M. Billod, it is only the first of these to which the name of pellagra properly belongs; the others being distinct affections, which, though often associated with the eruption, are so accidentally, and have no necessary connection either with it or with each other. The erythema often occurs without dyspepsia or nervous disorder, and the two latter occur also distinctly. That the three conditions are often associated arises from their origin in a similar cachectic diathesis, dependent on exposure to debilitating influences; just as various special diseases arise from the state of system attendant on the puerperal condition, as mania, convulsions, albuminuria, purulent infection, the milk-leg, &c. The proper pellagra is nothing but a cutaneous disease, originating essentially in exposure to the sun, sometimes, when violent, producing digestive disorder and febrile symptoms, and receiving a peculiar character from the pre-existing cachectic diathesis, but altogether independent of the dyspepsia and nervous disease, which have been considered essential parts of it, though these, originating in the same diathesis, may sometimes be associated with it.

The views of M. Billod are extremely plausible and may be correct; but it is yet too soon to consider them in the light of established truths. (*Note to the sixth edition.*)

Article I.

FUNCTIONAL DISEASES OF THE SALIVARY GLANDS.

Increased Secretion.—Salivation.—Ptyalism.—When salivation is so copious as to be deemed morbid, the liquor usually flows out of the mouth, or is discharged by spitting. The affection can be confounded only with the discharge of a similar liquid from the stomach; and this mistake is not unfrequently made by patients; but there can be little difficulty in forming a correct diagnosis, when it is recollected that, in the latter case, the liquid is brought up by an effort like that of eructation. Perhaps the most frequent cause of an inordinate flow of saliva is inflammation or irritation in some portion of the mouth or throat. It is in this way that the acrid substances denominated masticatories act. The chewing of tobacco is a frequent cause of salivation; and the discharge is sometimes so copious as to prove detrimental to the health. According to Bernard, acid substances, as vinegar, &c., are peculiarly powerful in provoking the secretion of saliva, which is an alkaline fluid. (*Med. T. & Gaz.*, Feb. 1860, p. 159.) Certain substances taken internally have a specific power of promoting the salivary secretion. This is especially the case with mercury. Nausea is often attended with a profuse flow of saliva; and various other gastric disorders have occasionally the same effect. A disposition to ptyalism sometimes accompanies pregnancy, and is frequent in certain diseases, as scurvy, hysteria, some states of mania, and especially hydrophobia, in which the patient, in some instances, spits almost incessantly. I have seen a case in which it apparently depended on suspension of the menses, and immediately disappeared upon a restoration of the function. Ptyalism generally subsides with the removal of the cause in which it originates, without special treatment. In some cases, it may be proper to employ measures directly to suppress it. For this purpose, the use of astringent solutions or infusions, as washes to the mouth, is most efficient. The vegetable astringents may be first employed, and, if these do not succeed, recourse may be had to alum, acetate of lead, or sulphate of zinc.

Deficient secretion of saliva is not an uncommon affection. It is marked by clamminess or dryness of the mouth. It is most common in low forms of fever, in which there is a general failure of the secretions, and is important chiefly as a sign of the condition of the system; the return of saliva in the mouth being frequently a signal of the decline or disappearance of the disease. It seldom requires any direct remedial measures; but, when an original affection, may sometimes be advantageously treated by local sialagogues, such as vinegar, tobacco, horseradish, mustard, mezereon, pellitory, &c.

Alteration of the saliva is not unfrequent in various diseases. It sometimes becomes acid, and thus proves injurious to the teeth; sometimes offensive to the smell, and consequently very inconvenient both to the patient and those in his vicinity. The latter condition is apt to occur in scurvy, in mercurial ptyalism, and various anomalous derangements of digestion, or of the blood. When acid, it may be corrected by the internal use of the soluble antacids, especially the carbonate or bicarbonate of soda, which readily enters the circulation. When fetid, it may sometimes be sweetened by means calculated to improve digestion, and alter the blood, among which a diet consisting, in due proportion, of fresh vegetables, milk, and fresh meats, is probably the most efficient. The local and internal use of creasote, nitromuriatic acid, the alkaline chlorides, permanganate of potassa, and charcoal may also prove useful. These substances may at least correct the fetor of the contents of the alimentary canal, and thus prevent the absorption of offensive substances, and their subsequent elimination by the salivary glands.

Article II.

INFLAMMATION OF THE SALIVARY GLANDS.

WHEN the parotid only is affected, the complaint is denominated *parotitis;* but very frequently the causes which produce this operate equally upon the submaxillary and sublingual glands; and the whole are more or less involved. Inflammation of these glands is marked by pain, heat, and swelling, which, in the parotid, are attended with stiffness of the jaws in the beginning, and sometimes a total inability to open the mouth in the progress of the complaint. The surrounding areolar tissue and the skin usually participate in the inflammation; and, in some severe cases, the whole neck and face are swollen, the head becomes painful, and difficulty of deglutition, and even of respiration, is experienced. The attending fever is often considerable. It is not always easy to distinguish inflammation of these glands from that of the areolar tissue exclusively, or of the lymphatic glands; though a careful examination of the seat of the pain and tumefaction, and of the progress of the affection from the beginning, will almost always lead to a correct conclusion. In the instance of the parotid, the prominence immediately beneath the ear gradually diminishing downward, the comparative immovableness of the tumour, and its less accurately defined outline, will sufficiently distinguish it from an inflamed lymphatic gland. The disease, if well treated, generally ends in resolution; but occasionally it runs on to suppuration, and is said sometimes to have ended in gangrene. When the parotid suppurates, the complaint is often tedious and very troublesome. The pus is generally discharged externally immediately over the gland, but sometimes finds an outlet through the external auditory meatus, leaving a fistulous opening; sometimes makes its way down the neck, dissecting the muscles as it proceeds; and has even been known to be discharged into the œsophagus and trachea. The glands are also liable to chronic inflammation, either original, or as a consequence of the acute. This may be distinguished from scirrhus by the greater hardness of the latter, its more unequal surface, and the character of the pain.

The disease may proceed from cold or mechanical injury; but is more frequently the result of inflammation of the mouth or fauces, as when occasioned by decayed teeth, or by tonsillitis. The parotitis arising from decayed teeth is sometimes very troublesome, ending in a painful and tedious suppuration. The mercurial influence is another, and among the most frequent causes of inflammation of these glands, which, however, in such cases seldom proceeds to suppuration. Parotitis is an occasional attendant upon other complaints. It may accompany scrofula and partake of its nature. It occurs in the course and towards the close of low fevers, especially the enteric, in which it is regarded by many as a favourable sign, though it may also, when considerable, add to the danger. In these cases, the inflammation is of a rather feeble character, and very prone to suppuration; and sometimes enormous abscesses are formed. It occurs not unfrequently as a sequela of scarlatina, and sometimes of other exanthematous fevers, and in these cases also tends to the formation of pus.

In the treatment of this inflammation, it is often sufficient to confine the patient to an exclusively vegetable diet, to keep him at rest, and to operate upon the bowels with saline cathartics; but, when the inflammation is considerable, and the fever high, blood may be taken from the arm, and afterward from the tumour by leeches; and the latter remedy may sometimes be advantageously resorted to, when the want of general strength forbids the former, or the moderate character of the disease renders it unnecessary. When there is much fever, the patient should be confined to bed, and treated with antimonials, and other refrigerant diaphoretics. Cold applications to the tumour are not generally deemed advisable. Liniments of camphor and laudanum may be employed to relieve the pain; and it is usually recommended to keep the parts warm. If a tendency to suppuration is obvious, it should be promoted by emollient poultices; and the abscess should be opened as soon as fluctuation becomes very evident.

Article III.

MUMPS.

Syn.—Specific Inflammation of the Salivary Glands.—Parotitis.—Cynanche Parotidæa.

Though named by nosologists from the parotid, this affection does not consist essentially in inflammation of the salivary glands; as is sufficiently proved by the tendency to metastasis, and the contagious origin of the complaint; both of which point to some change in the blood, or the presence in that fluid of some morbific agent, as the probable cause of the local affections.

Mumps usually begin with a feeling of stiffness about the joints of the jaws, which is followed by pain, heat, and swelling beneath the ear, but with little or no redness of the skin. The swelling rapidly extends in all directions, sometimes considerably down the neck; and the other salivary glands are not unfrequently involved. The skin is somewhat tense; but the tumour is not very hard or elastic. When the swelling is at its height, there is often great difficulty in opening the mouth, and sometimes deglutition is painful; though the latter symptom is frequently quite wanting, and the complaint may thus be distinguished from angina or cynanche tonsillaris. There is generally more or less fever; but in most cases not sufficient to confine the patient. Sometimes, however, it is very high, with a furred or dry tongue, loss of appetite, heat of skin, and even some delirium. The inflammation usually reaches its highest point in two days, continues unabated until the end of the fourth, and then gradually declines, disappearing in about a week, with a disposition to perspiration in the neighbouring parts, and sometimes over the whole surface of the body. The gland very seldom suppurates. I do not remember to have witnessed a case in which this result has occurred. When it does occur, the suppuration is said to be superficial. Sometimes only one parotid is affected, but more generally both, either simultaneously or successively. Not unfrequently the inflammation of the salivary glands suddenly subsides, and the testicle or mamma becomes painful and swollen. A metastasis has taken place. This I have noticed to occur especially in young males approaching manhood. When only one parotid has been affected, the testicle or mamma of the corresponding side is generally the seat of the translated disease. The labia pudendi in females are said sometimes to be attacked. Generally the new inflammation subsides in three or four days, without showing any tendency to suppuration. In some instances, it suddenly returns to the parotid, leaving the mamma or testicle sound. Translation may also take place to other organs. There is reason for the conjecture, that the pancreas is sometimes affected. That a metastasis to the brain occasionally happens is well known. This is, indeed, the chief danger of mumps, and sometimes ends in death. In some rare instances, after the inflammation has left the parotid, the irritant cause produces alarming constitutional disturbance and prostration of system, which disappear when the inflammation becomes established in its new locality. Mumps are usually a mild affection, and almost never terminate fatally unless under the circumstances above referred to.

Contagion is a frequent cause of mumps; but there is reason to believe that the disease also sometimes originates from epidemic or endemic influences independently of contagion, though, when thus produced, it is equally capable of self-propagation. It occurs most frequently in the young, and more frequently in males than females. Like most contagious affections, it seldom attacks the same individual more than once. Occasionally, however, it does so. Many escape it altogether. A case is on record in which a child, born of a mother affected at the time with mumps, was noticed to have painful swelling of the parotids the day after its birth.

In most cases of mumps, little treatment is requisite. It is usually sufficient for the patient to live low, and avoid exposure to cold and wet. Should the bowels be confined, refrigerant laxatives, as the Seidlitz powder or small doses of one of the neutral salts, should be given occasionally. All repellent applications to the tumour should be avoided, for fear that a metastasis may take place. It is indeed advisable to keep the parts warm, so as to prevent the repellent influence of the external cold, and to favour perspiration. This measure is peculiarly appropriate, in consequence of the absence of all disposition to the suppurative process. Singed tow is a popular and very suitable application; but carded wool or cotton, or a piece of soft flannel, may be substituted. If the inflammation should be considerable, and fever exist, the saline cathartics may be given more freely; and, if the fever should be high enough to confine the patient to bed, the antimonials, and other refrigerant diaphoretics may be added. Occasionally it may even be advisable to take blood from the arm; but this is seldom necessary. Should the inflammation be translated to the mamma or testicle, the same general treatment may be employed, while the part affected is in like manner to be kept warm. But, when the local affection is considerable, leeches should be freely applied, especially to the testicle. In the cases of young and vigorous men, it is sometimes proper to bleed generally as well as locally. The patient should be confined to the horizontal posture, the testicle should be sustained by a suspensory bag or other means, and emollient applications should be made after leeching. At the same time, it is advised to endeavour to recall the inflammation to the parotid by some stimulating application, as a sinapism or blister over the gland. In case of metastasis to the brain or other vital organ, antiphlogistic measures should be energetically employed, as in inflammation of these organs from other causes.

When chronic inflammation of the gland is left behind, which, according to Dr. Good, is apt to happen in elderly persons, and especially in females about the cessation of the menses, it should be counteracted by occasional leeching and blistering, the internal and external use of iodine, and, if other measures fail, by a very careful use of mercury. Dr. Good, who states that such cases are disposed to run on slowly to suppuration, and sometimes end in very obstinate and even fatal ulceration, recommends antimonial emetics as highly useful.

Article IV.

DISEASES OF THE PANCREAS.

From the deep-seated position of the pancreas, the vicinity of other important organs which almost always suffer along with it, and the want of any sure characteristic mark of derangement of its function, it is scarcely ever possible to distinguish its diseases with certainty. As its secretion is very similar to that of the salivary glands, which this organ also resembles closely in structure, it has been conjectured that the colourless discharges which occasionally take place from the stomach and bowels, as in pyrosis and serous diarrhœa, might, in some instances, be of pancreatic origin. But, though the fact may possibly be as supposed, yet it is altogether insusceptible of satisfactory proof; and, in relation to the functional diseases of the pancreas, we may be said to be wholly in the dark. Its organic affections are somewhat better known; their results being seen after death, and the symptoms thus verified, leading, in other cases, to probable inferences as to the seat and character of the disease. But even in these affections the diagnosis is very uncertain. A brief notice of them will, therefore, be sufficient.

Some experiments and speculations of M. Bernard, in reference to the proper function of the pancreas, have been supposed to have an important bearing on the diagnosis of the diseases of that organ. It was ascertained by that physiologist that the pancreatic secretion has a strong emulsive and saponifying power in relation to oleaginous matters, which, when mixed with it, are quickly brought into the state of a milky fluid, not unlike chyle in appearance. From these and other observations, he inferred that it is the exclusive office of the pancreatic juice to act on the fatty matters in digestion, and bring them into a state suitable for absorption into the lacteals. If this view be correct, disease of the gland, interfering with the due performance of its function, should be attended with evidences of the want of digestion of oleaginous substances used as food; and the truth is that, in various cases of pancreatic disease, proved to have been such by examination after death, undigested fat has been noticed in the evacuations from the bowels. At present, however, it cannot be admitted that there is any necessary connection between these events; as cases of pancreatic disease have occurred in which no fat could be found in the evacuations, and the conclusions of Bernard, in relation to the exclusive office of the pancreas, have been invalidated by the experiments of Frerichs and Lentz, who found fatty substances to be thoroughly digested and absorbed, without the aid of the pancreatic juice (*Am. Journ. of Med. Sci.*, N. S., xxiii. 222); and similar results have more recently been obtained by MM. Colin and Bérard (*Arch. Gén.*, Fév. 1858, p. 238). Besides, it has been determined that, in addition to its emulsionizing power over fatty substances, which it is said to reduce into their corresponding acids and glycerin (*Danilewsky*), it is capable of converting starch into glucose, and, as shown by M. Lucien Corvisart, has the property, when formed during the process of digestion, of dissolving albumen and fibrin, and thus performing a subsidiary part to the gastric juice, in relation to such portions of protein matters as may have passed undigested into the duodenum. (*Journ. de Pharm.*, 1864, 2e partie, p. 62.) These different effects are ascribed by M. Danilewsky to distinct principles contained in the juice. (*Virchow's Archives*, xxv. 279.)

Inflammation of the Pancreas.—Pancreatitis.—If we are to rely on post-mortem examination alone, it must be admitted that this affection is very rare; but it is highly probable that, when of an ordinary grade, it very generally ends in resolution, and, from the mildness and uncertainty of its symptoms, runs its course undiscovered. The following symptoms have been observed in cases in which dissection has proved the existence of inflammation of the pancreas. A fixed pain, increased by pressure, with or without heat, anxiety, or tension, is felt deep in the epigastrium, extending even to the back, and sometimes from one hypochondrium to the other. It is sometimes obtuse, sometimes acute and even pungent, and is occasionally increased by distension of the stomach, as after a meal, by a full inspiration, and by a position upon the back or the left side. This effect of position may be ascribed to the weight of the stomach, in the former case, and of the liver, in the latter, pressing upon the diseased gland. In a few instances, a firm, somewhat elastic, fixed, and circumscribed tumour may be felt in the epigastrium. The patient is apt to be affected with gastric derangement, exhibited in the forms of acid eructations, pyrosis, gastrodynia, nausea, and vomiting, which are apt to come on a few hours after the taking of food. Aortic pulsation in the epigastrium, often visible, and increased by pressure, is given by Professor Seibert, of Jena, as a characteristic symptom. It probably sometimes attends the affection, as the aorta would be very likely to be irritated by an inflammation so immediately in its own neighbourhood; but it also often arises from other causes, and cannot be relied on in the diagnosis. The bowels are almost always deranged, being either constipated, or affected with diarrhœa. In the latter case, the stools, though at first fecal, become afterward colourless, like saliva; and a somewhat similar fluid is discharged from the stomach. Jaundice has been observed in some instances, arising probably from pressure upon the common duct of the liver and gall-bladder. Fever also, of various grades, attends the affection. In chronic cases, the pain is less severe, there is little or no fever, and the tumour in the epigastrium occurs more frequently, and is more obvious. The appearance of undigested fat in the alvine discharges may be considered as offering some evidence of the existence of the disease. This probably ends generally in resolution; but sometimes it runs on to suppuration, and even to gangrene, though the latter result is very rare.

Dissection exhibits the gland, in acute cases, reddened and softened, in the more chronic, enlarged, hardened, or more dense than in health, of a reddish or yellowish-white colour, and with its surface sometimes adhering by means of false membranes to the neighbouring organs. When suppuration has taken place, pus is found either infiltrated in the parenchyma, or collected into an abscess, which has been known to fill the investing capsule, with the complete destruction of the glandular substance. Occasionally the pus has made its way into the stomach or bowels, the cavity of the abdomen, or between the layers of the mesocolon.

The *causes* of pancreatitis are obscure. The general causes of inflammation are probably capable of producing it. The disease has been ascribed to the influence of mercury, and the excessive use of tobacco. It probably arises more frequently from sympathy with the salivary glands, or a metastasis of irritation from these glands. Thus, inflammation of the parotid has been followed, upon its sudden disappearance, by the symptoms of pancreatitis, which have in their turn given way on the occurrence of swelling of the testicle. When the disease has been observed upon dissection, it has been most commonly in connection with inflammation of a neighbouring organ, as the stomach, duodenum, or liver, which has in all probability been primarily affected. It has been noticed also in hydrophobia and some idiopathic fevers.

There is nothing peculiar in the treatment. In acute cases, general and local bleeding, refrigerant diaphoretics, warm fomentations or cataplasms, and, after a sufficient reduction of excitement, blisters to the epigastrium, are the chief remedies. The whole antiphlogistic regimen must be observed. Chronic cases may be treated with occasional leeching, blistering, or pustulation, and, if they do not yield, a cautious use of mercury or iodine. The vomiting and diarrhœa are to be controlled by suitable measures (see *Vomiting* and *Diarrhœa*), and pain and restlessness by opiates or other narcotics.

Non-inflammatory Organic Affections.—The pancreas has been found *hypertrophied* and *atrophied;* but these conditions are very rare. *Softening* without inflammation has also been observed, especially in scorbutic and scrofulous patients. The gland is sometimes *indurated* without other change; and this condition has been considered as the commencing stage of scirrhus, though probably upon insufficient grounds. It has been known to undergo the *fatty* and *cartilaginous* degenerations, and occasionally becomes the seat of *calculous concretions*, *cysts*, *tubercles*, *cancer*, and *melanosis*. Of these organic affections, melanosis is the rarest, and cancer probably the most frequent. The latter disease has often been noticed upon dissection, and, independently of inflammation, is the one which chiefly demands attention.

Carcinomatous or *cancerous* disease of the pancreas is observed most frequently in the form of scirrhus. All parts of the gland may be affected, but more frequently only a portion is so; and by far the most common seat of the complaint is the right extremity. (Da Costa, *Morbid Anatomy of Cancer of the Pancreas*, p. 4.) The disease may be confined to the gland, or involve the parts about it. In either case, the functions of these parts may become deranged, in the first case from sympathetic irritation or undue pressure in consequence of the magnitude of the tumour, in the second by their own disorganization. These secondary phenomena often completely cover and mask the symptoms of the pancreatic affection, so that it cannot be detected, and may even escape suspicion. There is no end to the diversity of functional disturbance thus produced. Almost every conceivable variety of stomachic derangement, from mere dyspepsia to the most obstinate vomiting, arising from perforation of the walls of the organ, or obstruction of the pylorus or duodenum; hæmatemesis and intestinal hemorrhage; diarrhœa and constipation, the latter much the more frequent; jaundice from a stoppage of the choledoch duct; cough and other pectoral symptoms from affection of the diaphragm; dropsy from pressure on the great venous trunks; countless nervous irregularities from encroachment on the spinal column; these and other analogous phenomena, some in one case and some in another, attend the painful progress of the disease, through hectic fever and great emaciation, to a fatal issue. The diagnostic characters, upon which most reliance can be placed, are the seat and character of the pain and of the tumour. The former is often lancinating and intolerably severe. It is deep-seated in the epigastrium, sometimes almost seeming as if it occupied the spinal column, and often shooting irregularly into various parts of the abdomen and chest. It has, in some instances, been observed to be aggravated by the erect posture, and the patient seeks relief by bending forward. The gland is generally enlarged, and sometimes enormously so. It forms a hard, deep, fixed, incompressible tumour between the pit of the stomach and umbilicus, generally less superficial than that produced by scirrhus of the pylorus, and not always readily detected. It has been recommended, in doubtful cases, to place one hand over the epigastrium, and the other upon the corresponding part of the back, and then to make pretty strong pressure, which will occasion a deep-seated pain, and impart the sensation of the presence of a hard body, if the pancreas should be affected with scirrhous enlargement. Undigested fat in the stools would now be regarded as a confirmatory symptom. After all, an accurate diagnosis is of no great importance, as it cannot lead to efficient treatment. Nothing more can be done than to palliate the symptoms, and retard somewhat the progress of the disease by obviating irritation and inflammation, without materially lessening the strength. Vomiting, constipation, diarrhœa, and hemorrhage are to be treated as elsewhere directed; inflammation, when it is obvious, may occasionally be met by leeches, revulsives, and a mild diet; and pain and nervous irritation must be controlled by opiates, chloroform, or other narcotics, and by antispasmodics. When there is any reason to think that the tumour may not be of a malignant character, mercury or iodine may be resorted to with hope of benefit.

SUBSECTION IV.

DISEASES OF THE LIVER AND ITS APPENDAGES.

Article I.

INFLAMMATION OF THE LIVER, OR HEPATITIS.

INFLAMMATION may affect the substance of the liver, its investing peritoneal membrane, or both, and may involve the whole organ or only a part; and in each of these cases presents certain characteristic symptoms, which may lead to a more or less accurate diagnosis. Hepatitis varies also greatly in its degree of violence and rapidity; being sometimes acute, sometimes chronic, and not unfrequently of intermediate grades; so that it is not always easy to classify its diversities in these respects correctly.

Symptoms, Course, &c.

It will be most convenient, in the description of hepatitis, first to treat of it generally, and afterwards to indicate the characters which mark its several varieties, so far as these can be distinguished. The grades and forms of it which cannot be properly classified will thus receive their due share of attention.

The most characteristic symptoms of the disease are pain and tenderness in the region of the liver, including the right hypochondrium and epigastrium, and, when the organ is enlarged, a greater or less extent of the umbilical and lumbar regions, the left hypochondrium, and the chest. The pain varies in degree and nature with the seat and grade of the inflammation; being sometimes severe and acute, sometimes dull and aching; in certain cases confined to one spot, in others extensively diffused; stationary or wandering; continued or periodical; and occasionally either quite wanting, or amounting only to a slight and vague uneasiness. It is almost always increased by pressure over the part affected. Force applied over the false ribs or in the epigastrium will generally occasion uneasiness; but inflammation of the stomach and rheumatism of the intercostals yield the same sign; and the most effective mode of employing this means of diagnosis is to make pressure upon the under surface of the liver. The patient being placed upon his back, with the knees drawn up and the shoulders elevated, the ends of the fingers are to be pushed first directly backward beneath the edge of the ribs, and then upward with their joints flexed. The liver is thus compressed against the diaphragm, and tenderness is detected whether the interior or surface is inflamed. I have thus been able to demonstrate the existence of hepatitis, when all other evidences have been equivocal. In this manner we are often also able to discriminate between tenderness of the colon and of the liver, the former being evinced by pain when the points of the fingers are pressed directly backward, the latter when they are turned upward. Should the liver extend much below the ribs, this method of diagnosis is neither applicable nor requisite.

A deep inspiration increases the pain by the descent of the diaphragm on the liver, and, when the convex surface is acutely inflamed, the patient often suffers from the same cause, even in ordinary respiration.

Pain is also frequently experienced in other parts. Thus, pain in the right shoulder has long been considered diagnostic of hepatitis. It is not found in every case; but, when it exists in connection with tenderness in the right hypochondrium, it may be considered as a strongly confirmatory symptom. The sensation is rather aching than sharply painful, and often extends to the subscapular and clavicular regions, and sometimes down the arm even to the wrist. It must not be confounded with the pain of rheumatism, which often affects the same parts, and, if not discriminated, might sometimes lead to a mistaken diagnosis. The pain may be considered rheumatic, when increased materially by movement of the shoulder or neighbouring muscles, or by pressure on the part. When dependent on hepatitis it is purely sympathetic, and is often increased by pressure on the liver. It is thought to indicate inflammation of the right lobe, and especially of the convex surface. When the left lobe is inflamed, the sympathetic pain is said to be felt in the left shoulder. Pains are also occasionally experienced in other parts, as on both sides of the chest, in the head, the loins, and the lower extremities; and in these situations they are sometimes more severe than in the seat of the disease.

It must be borne in mind that neuralgic pains are often felt in the region of the liver, when that organ is perfectly sound. These are generally connected with a rheumatic or gouty diathesis, and care must be taken not to confound them with such as are truly inflammatory. They may usually be distinguished by the absence of the other signs of hepatitis. I have known a female patient, otherwise in good health, affected with such pains almost steadily for thirty years, with only an interval of two or three years, during which she suffered with insanity.

The decubitus is of some significance in this affection. The patient generally lies on the right side, or on the back somewhat inclining to the right. A position upon the left side is often attended with a painful dragging sensation from the right towards the left hypochondrium, arising probably in part from the greater tenderness of the folds of the peritoneum by which the liver is suspended, and partly from the increased weight of that organ, increasing the tension of the ligaments. It is possible also that, when the liver is greatly enlarged, it may occasion uneasiness by pressure upon the stomach. But this symptom is by no means constant; and sometimes the patient prefers lying upon the left side. In acute cases, the sitting posture, with the body bent forward, is occasionally found to be the least painful.

Increase of the bulk of the liver is another frequent though not uniform attendant upon hepatitis. In the healthy state, it seldom extends beyond the sixth rib upward, or the lower edge of the false ribs downward, and is scarcely to be detected in the left hypochondrium. Beyond these dimensions, it may generally be considered morbid. In some instances, especially in chronic disease of the organ, it becomes enormously enlarged; and cases have occurred in which it has reached as high as the third rib, has descended into the iliac fossa, and occupied almost the whole left hypochondrium.

But, in estimating this diagnostic symptom, we must bear in mind that the liver is liable to be displaced, and that it may be observed in wholly abnormal positions without any enlargement. Thus, it may be pressed upward in the chest by abdominal tumours and dropsy, or downward through disease of the lung or pleura; and may fall much below the ribs in consequence of relaxation or stretching of the suspensory ligaments. Four cases of *dislocation of the liver* have come within my own observation, in which the gland, though itself in all respects healthy, could be distinctly felt occupying the lumbar region, and could even be taken between the thumb and fingers of the examiner.

In one, the descent could be traced to a very large scrotal hernia, which had existed in early life; in another, it was probably owing to adhesion formed between the lower surface of the liver and the uterus from an injury, and consequent peritoneal inflammation, during pregnancy. In both, the symptom, connected as it was with occasional uneasiness in the side and epigastrium, caused much solicitude, which was relieved when the nature of the affection was understood. In the third case, the result was ascribable to a fall, which had probably ruptured the suspensory ligament. In this instance, the liver, in its false position, was mistaken for an abdominal tumour, and caused great mental uneasiness to the patient, until informed of the nature of the affection. The same solicitude existed in the fourth case, which, however, though clearly of like character with the others, I could not trace to any special cause. Such displacements may be detected by placing the patient on the back, when the liver either retires, or may be readily pushed within its proper limits. Percussion, moreover, by marking its outlines both above and below, will demonstrate that the phenomena are ascribable not to its enlargement, but to its abnormal position.

Increased bulk of the liver may often be rendered obvious to the eye by stripping the patient, and comparing the two sides. The lower ribs on the right side will be observed to bulge outward and forward considerably beyond their proper outline. Any inequality of the sides will be most easily discovered by standing at the foot of the patient, and running the eye upward along the body, as suggested by Mr. Twining. When below the ribs, or the due boundary of the epigastrium, the outline of the liver may be usually felt by the fingers, especially when the patient is thin, and the abdominal muscles not very rigid. To facilitate the examination, the lower limbs should be drawn up, and the shoulders elevated, so as to relax the abdomen; or the patient may sit up with his body bent forward, or he may be placed upon his elbows and knees, so as to throw the liver forward. But various circumstances often interfere to obscure the diagnosis, such as fat, tumours in the abdomen, ascites, &c.; and the aid of percussion may in such cases be advantageously resorted to. The sound yielded by the liver differs greatly from that of the ordinary contents of the abdomen below, and the lungs above. The extent of the liver is usually commensurate with that of the continuous flatness from the middle of the hypochondrium in all directions. Below is the clearer sound of the intestines and the stomach, above and at the left extremity, that of the lungs. It should be recollected, however, that a portion of the lung intervenes between the liver and the ribs, gradually increasing in thickness upward, so that the hepatic sound is somewhat modified, and in a gradually increased degree, by the pulmonic, as far as the sixth or seventh rib, when the latter should be exclusively heard. If the dulness extends below the edge of the false ribs posterior to the angle, or considerably below it anterior to the angle, or more than an inch or two beyond the mesial line towards the left side, or above the sixth rib, the liver, unless displacement should be obvious, may be considered as enlarged. Tumours in the abdomen, pleuritic effusion in the right side, and consolidation of the lung from pneumonia, might interfere with the diagnosis. But, in the first case, there would generally be observed a clearer sound between the liver and the tumour, which, moreover, might often be detected by being movable; in the case of pleurisy, the outline of the dulness changes with the position of the patient; and, in pneumonia, the sound is scarcely so dull as that of the enlarged liver, and at all events there are other signs, both physical and rational, which sufficiently mark the distinction, and which are indicated under inflammation of the lungs. Sometimes a thin edge of the liver extends below the ribs, in front of the intestines and the stomach; in which case the flat hepatic sound is modified by the hollow organ behind; but in this case there is still some dulness, the lower limits of which will mark the extent of the liver. A comparison between the extent of the hepatic sound downward and upward will show whether the liver is enlarged or merely displaced. In women who dress tightly, the liver is pushed further towards the left than in the normal state.

According to Dr. Malcolmson, auscultation affords a sign indicative of hepatic encroachment upon the lungs; a loud sound, namely, between a crepitant rale and a bleating, owing, as he supposes, to the thin edge of the lung being compressed by the enlarged liver against the pleura. This sound is audible to the patient and even the bystander, and attended by a vibration of the thoracic parietes sensible to the hand. (*Thompson on Dis. of Bil. Organs.*) Dr. Walshe states that the sound occurs only in inspiration, near the end of the act, and requires a forced expansion of the chest for its development. (See *Am. Journ. of Med. Sci.*, N. S., xx. 484.)

The consistence of the liver is frequently altered. In the healthy state, though much firmer than the intestine, it has a certain degree of yieldingness and elasticity, which may give place, especially in chronic inflammation, to a greater or less degree of induration, readily detected by examination with the hand. But neither enlargement nor induration can be considered as necessarily indicative of inflammation, unless attended with other symptoms, as they may result from organic changes of a different character.

Cough is a frequent symptom, generally short and dry, but sometimes attended with expectoration. It may arise from pressure upon the lung, from the sympathetic propagation of irritation, or from the pulling down of the diaphragm by the weight of the liver. In acute cases, it comes on generally within a day or two from the commencement. Occasionally it appears to depend upon bronchial inflammation occurring simultaneously with the hepatic, and probably from the same cause. *Dyspnœa* and *palpitation* sometimes result from the encroachment of the liver upon the lungs and pericardium.

The stomach is very apt to be disordered; and gastric distress, nausea, and vomiting sometimes of bilious matter, and sometimes of mucus or the ordinary contents of the stomach, are not uncommon.

The bowels are in some cases constipated, in others affected with looseness; and the stools are generally unhealthy, evincing, by an excess or deficiency or perverted state of the bile, a derangement of the secretory function of the liver. Now and then also dysenteric symptoms appear, with mucous or bloody stools. Hiccough is an occasional symptom.

The eyes, and the skin upon the upper part of the body, are often yellowish, the urine is also deep-yellow or orange-coloured, the fur on the tongue is yellowish, with a bitterish taste in the mouth, and sometimes the patient is completely jaundiced. But these symptoms are often wanting, and probably occur only when the parenchyma of the liver, or the biliary ducts, are the seat of disease.

Depression of spirits, a gloom sometimes amounting to insanity, headache, delirium, and coma occasionally evince the sympathy of the brain. These symptoms may also be ascribed to a morbid state of the blood, arising from defective hepatic secretion. Whatever may be the cause, hepatitis both acute and chronic is frequently attended with a melancholy, morose, or hypochondriacal state of the mind.

There is generally more or less fever, and almost always in the acute form. It is usually ushered in with rigors, and does not differ from that which results from inflammation of other important organs. (See *Fever.*) It is of every grade, from a mild febricula, showing itself in a moderately accelerated pulse with heat of skin, occurring towards evening, and subsiding in the night, up to a continued and tumultuous vascular disturbance, with all the other phenomena which characterise this form of disease. In most instances, the febrile action is sthenic; but sometimes it assumes the typhoid character, especially in the advanced stages. It is not, however, an essential accompaniment; for hepatitis has been known to run its whole course to the formation of an abscess, without the least sign of febrile disturbance.

The *course* of the disease and its *duration* are exceedingly various. It may last only a few days, or continue for weeks, months, or years; and may terminate in resolution, or run on to suppuration, induration, or gangrene, though there is reason to believe that the last termination is very rare. Under proper treatment, resolution may be generally effected. The febrile action subsides, the pain and tenderness gradually diminish, the tumefaction disappears, and the patient is restored to health. But, if due measures be not employed, and especially if the original cause continue to operate, suppuration is very apt to ensue, either quickly or after a shorter or longer delay, according to the degree in which the case is acute or chronic. Not unfrequently, under similar circumstances, the acute subsides into the chronic form, which may ultimately yield to proper remedies, or, after numerous alternations, may at last end in abscess, or other not less serious organic change. This is especially liable to happen in hot climates, where the original cause operates unceasingly, and the patient is in constant danger of a new accession, before the original attack has been completely subdued. In the variety of hepatitis which attends dysentery, and which is apt to occur, in certain states of the system, whenever there is a suppurative focus in any part of the body, the tendency to suppuration is very strong; so that this may ensue in the course of two or three days from the first appearance of disordered hepatic symptoms, and sometimes even without any previous symptoms whatever that have called attention to the liver.

The occurrence of *suppuration* is often marked by general rigors or chilliness; increased frequency of pulse, which is usually, according to Twining, above 105, though softer and weaker than before; relaxation of the surface with a tendency to perspiration; and a feeling of weight or throbbing in the side, with a diminution of pain if this was previously acute. After the process has been fairly established, copious sweats are apt to occur during sleep, and sometimes complete hectic fever sets in, with great debility and exhaustion. Upon examining the side, it will sometimes be observed that, in place of the general intumescence, there is a more or less circumscribed swelling, which has at first a soft pasty feeling, and at length yields obvious signs of fluctuation, indicative of the presence of pus. This gradually advances towards the surface, and, if adhesion take place between the hepatic and parietal peritoneum, may ultimately be discharged by the spontaneous or artificial opening of the abscess. The opening may take place at any point in the vicinity of the liver, whether below or between the ribs, anteriorly or posteriorly, or in the epigastrium. When between the ribs, the abscess is marked by a bulging of the intercostal spaces, which, in connection with the fluctuation of the tumour, and its circumscribed character, is one of the most certain diagnostic symptoms. The pus, in abscess of the liver, most frequently takes the external direction; and, as the right lobe is most frequently the seat of inflammation, and its convex surface presents externally, the liquid will generally, unless in cases of great enlargement, seek an outlet between the ribs. Death from the combined exhaustion and irritation frequently occurs before the abscess opens, and the same causes may lead to a fatal issue after this event; but the patient is almost always relieved by the discharge, and is often restored to health. One great source of danger is the breaking of the abscess into the cavity of the peritoneum, in consequence of the want of adhesive inflammation between the opposite surfaces of that membrane, or the insufficiency of the adhesion that may have taken place. The patient is, under these circumstances, generally carried off speedily by peritoneal inflammation; though this event does not necessarily follow; as the pus, if small in quantity, may remain circumscribed, and, becoming ultimately confined, in the form of an abscess, by the inflammation excited by its own presence, may seek its way externally, either through the intestines or the surface of the body.

But the external direction, though the most frequent, is not the only one taken by hepatic abscesses. When the abscess is at the convex surface of the liver, the diaphragm becomes necessarily involved in the adhesive inflammation that precedes the progress of the pus, which, making its way through that muscle, may be discharged into the cavity of the pleura, if the opposite surfaces of this membrane should not have been united, thus constituting empyema. But much more frequently this union takes place, and the pus is either discharged externally between the ribs, as already noticed, or makes its way into the substance of the lungs. Even in this case, it may still reach the surface by the consolidation of the lung, the adhesion of the pulmonary to the parietal pleura, and the gradual march of absorption towards the skin. But, instead of taking this direction, it is sometimes discharged into the bronchial tubes or pulmonary tissue, where it may either produce suffocation, or excite fatal inflammation of the lung, or ultimately escape by expectoration. In the latter case, the purulent matter coughed up is often tinged with bile; and even pure bile is said to have been sometimes expectorated. The affection has been named hepatic phthisis, and, though always dangerous, is by no means necessarily fatal; as many instances of recovery are on record.

When the abscess is seated near or upon the lower surface of the liver, it sometimes finds a safe outlet through the stomach and intestines, the peritoneal investment of which becomes agglutinated to the hepatic. When the pus enters the stomach it is usually discharged by vomiting; when the colon, by stool; when the duodenum, by one or the other mode. It is therefore highly desirable, when hepatic abscess is suspected, that the matter discharged by vomiting or purging should be inspected. If at any time a copious evacuation of pus should suddenly occur, there will be reason to suppose that the abscess has opened, and to hope for a favourable issue.

It is thought that the pus sometimes penetrates the biliary ducts, and thus finds a passage into the duodenum, without disturbing the integrity of the hepatic or intestinal investments. In some very rare instances, it has escaped from the liver by other routes, as into the pericardium, vena cava, and pelvis of the kidney. There is reason to believe that it is sometimes absorbed, the abscess being gradually filled up by granulations, and leaving only a cicatrix. Some have supposed that the pus which has been occasionally discharged by urine, and from the bowels, in cases of hepatic disease which have afterwards recovered, has been absorbed from the abscess of the liver, and been thrown off again by these emunctories after having entered the circulation. But this hypothesis is inadequately supported by facts.

It is important to distinguish between abscesses and other morbid collections of fluid, such as serous cysts, hydatids, and especially distended gall-bladder. For the diagnostic characters of these affections, the reader is referred to the heads of non-inflammatory organic diseases of the liver, and of diseases of the biliary passages.

Hepatitis is a fruitful source of other morbid affections. Of these one of the most serious is dropsy, and especially ascites. It is said that the affection of the liver which leads most frequently to this result is the organic degeneration denominated cirrhosis; but I have so often seen dropsy of the abdomen, connected with disease of the liver, yield to appropriate treatment directed to that organ, that I cannot doubt of its occasional origin in ordinary hepatitis. Various diseases of the alimentary canal have occasionally the same origin, as dyspepsia, bilious colic, diarrhœa, and dysentery; and, when it is considered how close is the sympathetic relation between the liver and that canal, and how intimately the two structures are connected in their circulation, it would seem scarcely possible that one should be extensively diseased, without interfering in some degree with the functions of the other, if not with its organization. Disease of the spleen is also frequently dependent on that of the liver; and jaundice is so common a result as to be ranked among the symptoms of hepatitis. It is not improbable that other organic affections of the liver itself may occasionally either directly result from inflammation of the viscus, or be called into action by its influence upon an existing predisposition.

Reference has already been made to different forms of hepatitis. The following deserve attention; and it must be understood that, in their description, only those modifications of the phenomena already enumerated are noticed, which are somewhat peculiar to the several varieties, and essential in their diagnosis.

Acute Hepatitis.—This, though a very frequent disease within the tropics, is comparatively rare in cold and temperate latitudes. It is also a much more violent and fatal disease in the former than in the latter situation. In severe cases, it is usually ushered in with great pain, tension, or feelings of oppression in the region of the liver, sometimes attended with difficult respiration. Simultaneously, or somewhat subsequently, the patient is affected with chills, followed by the symptoms of severe pyrexia, among which nausea and vomiting or other gastric disorder are usually prominent. In some instances, the febrile symptoms precede any striking local evidences of the disease. The pain is sometimes sharp and almost lancinating, at others obtuse, heavy, and aching. In milder cases, the onset of the disease is less sudden, the pains less severe, and the fever more moderate; and sometimes only a degree of hypochondriac or epigastric uneasiness is felt, preceding, for a time, and afterwards accompanying the phenomena which mark the sympathy of the system at large, and especially of the stomach, with the hepatic disorder. The bowels are usually constipated, though sometimes relaxed, and the urine is scanty, high-coloured, and often bilious. The disease runs a brief course; and a week rarely elapses before a tendency to resolution or suppuration becomes evident. Not unfrequently the severe symptoms yield very quickly to active treatment; but the inflammation remains unsubdued, and, if remedial measures should be suspended, or too soon relaxed, will be apt to advance to suppuration, or at best to assume the chronic form. The symptoms of acute hepatitis vary with the part of the liver affected.

When the *peritoneal coat* is inflamed, the pain is sharp, and usually much more severe than when the disease is seated in the substance of the organ. The pain upon inspiration, and the consequent difficulty of breathing are also much greater; and neighbouring organs are more apt to suffer sympathetically. The locality of the inflammation may often be conjectured from the effect upon contiguous parts. Thus, when the convex surface is inflamed, the irritation extends more readily to the diaphragm and pulmonary organs; and the cough is consequently more troublesome, while inspiration is more painful than under other circumstances. On the other hand, inflammation of the lower surface affects especially the stomach and bowels; the gastric symptoms being most prominent when it is seated in the left lobe, and the intestinal when in the right. It rarely happens, however, that the peritoneal coat is much inflamed, without involving also the substance of the liver to a greater or less depth. Hence, the symptoms characteristic of the inflamed parenchyma are apt to be mingled with those of the membranous affection.

The *substance* of the liver is known to be inflamed when the pain is obtuse and aching, the size of the organ considerably augmented, the conjunctiva and skin considerably jaundiced, and the urine loaded with bile. The yellowness of the skin, being ascribable to a deposition of colouring matter from the overloaded blood, must result from some cause which interferes with the secretion or excretion of the bile, especially the former; and this consequence is much more likely to ensue from disease of the secreting parenchyma than of the investing membrane.

The *locality* of the parenchymatous inflammation may be inferred from the position and limited extent of the pain and tenderness, and from the peculiar sympathetic phenomena evolved. Thus, inflammation of the right lobe occasions pain and tenderness in the right side, and pain in the right shoulder; of the left lobe, pain and tenderness in the epigastrium, and pain in the left shoulder. The pulmonary symptoms may be expected to predominate when the inflammation is limited to the upper portion of the right lobe; the intestinal, when to the lower portion of the same lobe; and the gastric, when to the left lobe. According to Twining, a greater tension of the right rectus muscle than of the left, or of other parts of the abdominal parietes, indicates a tendency to inflammation and abscess in the substance of the right lobe; and the same author has observed a similar condition of the left rectus in patients who have afterwards died of abscess of the left lobe.

Chronic Hepatitis.—Chronic inflammation very generally affects the substance of the liver. It is not unfrequently a sequela of acute hepatitis, but is, perhaps, still more frequently an original affection. It often comes on very insidiously, and may, indeed, run its whole course to suppuration or a cure, without any symptoms which would strongly call attention to the seat of the real disease. When, therefore, the slightest cause of suspicion exists, a careful examination should be made of the condition of the liver, which, if inflamed, will evince the fact by some degree of tenderness upon pressure, or some increase of its bulk. The phenomena in these masked cases are often almost precisely those of dyspepsia, attended, as that complaint frequently is, by derangement of the hepatic secretory function. In most instances of the disease, however, the obvious symptoms are more characteristic. These it is unnecessary to repeat in much detail, being the same as those already mentioned as belonging to hepatitis in general, only moderate in degree. The pain is seldom acute or very severe, unless when the disease is complicated with neuralgia or cancer. Occasionally, instead of positive pain, there is only a vague uneasiness, or sense of weight or distension, and sometimes not even these. There is, however, almost always tenderness upon strong pressure, especially if directed upwards under the ribs. Enlargement and some degree of induration are not uncommon. Sometimes the liver is contracted. Disordered stomach, occasional vomiting, irregular bowels, unhealthy alvine evacuations, a bitter or otherwise disagreeable taste, a tongue somewhat furred, a turbid or jaundiced hue of the eyes and skin, a harsh, dry surface, high-coloured, bilious, and acrid urine, which often irritates the urethra as it passes, a short dry cough, depression of spirits, slight febrile excitement towards night, and general emaciation, constitute an epitome of symptoms, which, variously grouped, and in different degrees, no one being uniformly present, are, in connection with those above mentioned, sufficiently characteristic. Chronic hepatitis, like the acute, not unfrequently ends in suppuration; but it may prove fatal by interfering with the various vital functions, and gradually wearing out the strength, without reaching that process. When not complicated, or sustained by the continuance of its cause, it will generally yield to suitable treatment.

Anatomical Characters.

As hepatitis is rarely fatal in its first stage, the physician seldom has an opportunity of examining its earlier anatomical characters. It is only in cases of death from some other disease, in the course of which the patient has been attacked with inflammation of the liver, that this opportunity is presented. When the investing coat is inflamed, it is redder and more vascular than usual, somewhat thickened, and often covered with an exudation of coagulable lymph, either semi-fluid, or so consistent as to glue together the contiguous surfaces. This exudation in time becomes vascular, and the foundation is thus laid for those permanent adhesions which are occasionally observed between the liver and neighbouring organs. When the parenchyma also is inflamed, the viscus is found partially or wholly congested with blood, more or less enlarged, generally softer and more friable than in health, presenting, when torn, a granular aspect, a brighter and deeper colour than natural, and a considerable oozing of blood. "Upon making a section of the viscus with a very sharp scalpel, and wiping with a sponge the cut surfaces, these present a lighter-colured reticulum or mesh, studded with red or brick-red granulæ, and the divided ends of blood-vessels and biliary ducts." (*Annesley.*) Sometimes effusion of blood is observed, either diffused through the parenchyma, or filling distinct cavities, which it appears to have hollowed out in the substance of the organ. · The outer surface is, in some instances, variously shaded with "red, brown, brick-coloured, greenish-brown, and even with almost black spots and streaks." (*Annesley.*) In the advanced stages, especially in the chronic form of the disease, the liver is sometimes indurated and enlarged from the coagulable lymph exuded into its tissue, and this induration may occupy either a part or the whole of the organ. Sometimes, along with the induration, there is diminution of bulk instead of enlargement. This may be explained by the contraction of the fibrin which had been exuded around the vessels, and the consequent diminution or obliteration of their caliber, giving rise to atrophy from want of blood. But more frequently, instead of induration, we find softening, either partial or general; and this is sometimes very great, so that the texture of the organ is completely broken up, and the parenchyma reduced almost to a pulpy mass. In the chronic indurations, the colour, instead of being darker or redder than in health, as is usually the case in the inflammatory softening, is apt to be light, and even yellowish-white.

But among the most frequent appearances presented by the liver, in advanced and fatal cases of hepatitis, are abscesses occupying either the substance or surface of the organ. When situated in the parenchyma, they appear to have been formed by a softening of the part affected, the subsequent infiltration of a sero-purulent fluid, and the gradual solution or absorption of the softened tissue, while the production of pus increases. The parts about the forming abscess are more vascular than natural. Sometimes there is only one abscess, sometimes two or more, and occasionally they are very numerous. They are of all sizes, from that of a filbert or less, up to that of one of the lobes, or even of the whole organ. Cases are on record in which the liver appears to have been converted into a purulent mass, enclosed in the investing membrane. The pus of one of these abscesses has been known to weigh eleven or twelve pounds. They are more apt to occupy the right than the left lobe. Sometimes they are encysted, that is, surrounded by a smooth membranous sac, resulting from the exudation of coagulable lymph; sometimes the pus is contained in a cavity which appears merely to have been hollowed out of the substance of the liver, the parenchyma of which forms its walls. The pus is either genuine, as in ordinary abscesses of the areolar tissue, or is variously altered, being sometimes contaminated with bile, or the remains of the disorganized substance of the liver, and presenting very different qualities of colour and consistence. Thus, it may be reddish, greenish, or blackish, and either as thin almost as water, semi-liquid, or nearly concrete. Abscesses have also been observed upon the surface of the liver, produced either by the deposition of pus beneath the peritoneal coat, or in cavities formed by adhesions between that coat and contiguous surfaces.

Cicatrices of abscesses occasionally exist upon the surface and in the interior of the liver, at least portions of fibrous or cartilaginous matter have been noticed, with radii extending to a greater or less distance from the central point, which have been taken for cicatrices, and with the greater probability, as they have been found in persons who had been suspected, during life, of having been affected with hepatic abscess. (*Thompson on Diseases of the Liver and Biliary Passages.*)

Instances of undoubted gangrene of the liver, following inflammation, have been recorded; but they are very rare; and most of the cases which have been considered as gangrene, were probably mere softening, as the fetid odour was wanting.

Causes.

The most frequent cause of hepatitis is long-continued exposure to heat. Hence, the disease is much more common within the tropics than in cold or temperate latitudes, and is generally prevalent in proportion to the degree and continuance of the heat, though this is not uniformly the case. An elevated temperature probably operates as a direct stimulus to the liver, and either excites it into inflammation, or sustains it in a state of excessive action, which strongly predisposes it to take on that condition, when exposed to the influence of any other cause. It is probable, also, that the liver is kept, in hot climates, in a constant state of exaltation by the duty of discharging from the system the excess of carbon, thrown upon it in consequence of an insufficient elimination of that substance through the lungs.

Among the agencies which co-operate with heat, one of the strongest is probably that exercised by vicissitudes of temperature; by changes, for example, from hot and dry to cold and damp weather, or by exposure to cold in any mode when heated and perspiring from over-exertion.

Miasmatic influence is also probably among the frequent causes of hepatitis. That it is capable of producing this effect indirectly, through the agency of the morbid processes which it sets up in the system, admits of no doubt; for inflammation of the liver is one of the recognized accompaniments and results of bilious remittent and intermittent fevers. But there is also strong reason to believe that it is capable of immediately deranging the hepatic actions, and, under favouring circumstances, of producing hepatic inflammation. How otherwise can we explain the greater prevalence of all ordinary morbid affections, having their origin in the liver, in hot miasmatic regions than in those which are at the same time hot and dry?

Hepatitis is said to have been sometimes epidemic; but it is highly probable that, where this has been thought to be the case, a closer examination would have discovered some local cause sufficient to account for the result, as, for example, miasmatic exhalation.

Many other causes of this affection have been enumerated; as direct injury to the liver by falls, blows, &c., or by the presence of gall-stones; violent and fatiguing bodily exertion; excess in the use of rich animal food; intemperate drinking; the abuse of mercury; the translation of gout or rheumatism; the suppression of accustomed discharges, especially from the hemorrhoidal vessels; paroxysms of violent emotion, as of anger, terror, &c.; and continued mental depression from grief, disappointment, or anxiety. Perhaps the most fruitful of these is habitual intemperance, which, in a vast number of instances, even in temperate latitudes, lays the foundation of chronic disease of the liver. That alcohol taken into the stomach should act with special energy upon the liver will be readily understood, if the prevalent opinion be admitted, that it enters the circulation by the route of the portal veins, and must, therefore, be distributed through the liver before it can reach the system generally. Much stress too has been laid, by some writers, upon the abuse of mercury, especially of calomel, given in such unstinted measure as it often has been in the treatment of bilious fevers, and other diseases incident to hot seasons and climates. The late Dr. Chapman, of the University of Pennsylvania, expressed, in decided terms, his opinion to this effect, and his experience entitles that opinion to great weight. The well-known excitant influence of mercury upon the hepatic functions, would of itself render the production of inflammation from a great excess of its action a highly probable result. I cannot, however, say, though much in the habit of using mercury as a remedy, that I have myself witnessed such an effect; but the reason may be that I have generally been very careful to use it moderately.

The liver is undoubtedly often inflamed through the agency of morbid conditions of other parts of the system. Diseases of the heart which impede the flow of blood into its right cavities, and diseases of the lungs which produce indirectly the same result, frequently disturb the hepatic function, and favour the production of chronic inflammation, by occasioning congestion of the ascending cava, and consequently of the liver. Tumours pressing upon the vena cava may have the same effect. Disorders of the stomach and intestines notoriously affect the liver. Between these structures so close a sympathy exists, that some derangement of the one might be expected as an almost necessary result of serious disease in the other. It is supposed that irritation or inflammation of the orifice of the ductus communis choledochus may travel to the liver, and thus excite hepatitis. But the chief source of disorder of the liver, consequent upon diseases of the alimentary canal, is probably the change in the quantity and character of the blood sent into the former organ through the portal vessels. How frequently must hepatic congestion result from an over-active circulation in the stomach and bowels! Besides, the noxious contents of the alimentary canal, whether introduced from without, or resulting from morbid secretion or chemical changes in the canal itself, are frequently absorbed into the portal vessels, and carried by its ramifications through every part of the liver before they can enter the system. Upon this organ, therefore, their injurious influence must be first exerted. Hence, dyspepsia, chronic gastritis and enteritis, dysentery, colic, &c. are not unfrequently associated with hepatitis, especially in the chronic forms, either as cause or effect. Probably sedentary habits favour the production of chronic hepatitis, chiefly by their primary influence on the alimentary canal. Diseases of the brain have also frequently been observed in connection with hepatic inflammation, but whether in the direct relation of cause and effect has not perhaps been so clearly demonstrated. Abscesses in the liver, as the result of fatal injuries of the brain, have often attracted the notice of pathologists; and many have ascribed them to a direct sympathy between these organs. But similar abscesses have been observed after surgical injuries elsewhere, such as amputation of a limb; and it is well known that the liver is peculiarly apt to feel the influence of those diseases in which the blood may be supposed to suffer under peculiar contamination, such as cancer and fungus hæmatodes. It is now, therefore, supposed that hepatic abscesses, following extensive injuries, are the result rather of phlebitis and the consequent introduction of pus into the circulation, or of a purulent infection of the blood from some other cause, than of mere sympathy. A similar origin is ascribed by Dr. George Budd to the abscesses of the liver, so frequently found connected with ulcerations of the stomach and bowels, particularly of the large intestines in dysentery. The ulcer is the source of some acrid product, which, admitted into the blood-vessels, induces that condition of the blood which tends to the formation of metastatic abscess. (See *Metastatic Abscess* or *Purulent Infection*.) Dr. Budd thinks also that hepatic abscesses sometimes originate, on similar principles, from ulcers of the gall-bladder. (*Diseases of the Liver*, 2d ed., p. 84.)

Finally, age and sex are supposed to have some influence in the causation of hepatitis; and it has been said that children and females are less liable to the disease than adults and males; but, if this difference really exists, it is probably much more owing to difference in exposure to the causes, than to any peculiar susceptibility of constitution.

Treatment.

In *acute hepatitis*, when the pulse is strong, and the constitution unimpaired, blood should be taken from the arm in quantities proportionate to the severity of the disease. Bleeding is especially demanded when there is reason to believe that the peritoneal surface is affected; but it is highly important also in the exclusively parenchymatous inflammation. The amount taken should be limited only by the effect upon the symptoms and the circulation. It is so altogether uncertain that no definite rule can be given. In urgent cases the bleeding should be copious, and may be repeated once and again if apparently called for. Even in cases less strikingly developed, it may still be important to resort to this remedy; but always with reference to the previous habits of the patient, and the general condition of his system. It is said not to be borne so well in hot as in temperate climates.

Local bleeding is an excellent auxiliary to the lancet, or substitute for it when forbidden. It is very rarely indeed that, in acute hepatitis, blood cannot be taken with propriety from the vicinity of the disease. Some recommend preferably bleeding from the hemorrhoidal vessels; but I believe that, in inflammation of an interior organ, no position is upon the whole so favourable for local depletion as the surface of the body immediately over the part affected. Theory may indicate another point as having a closer vascular connection with the inflamed organ; and it may be difficult to account, in the present state of our knowledge, for the extraordinary influence of the loss of blood from the surface; but speculation should yield to an experience almost universal, and which appears to me to hold as well in this as in other instances. Cups or leeches may be employed. The latter are preferable when there is great tenderness upon pressure, and should of course be used when blood is to be taken from the anus. But, other circumstances being equal, cups are preferable to the side, and especially over the ribs, in consequence of the considerable revulsion they produce in addition to their depletory effect.

Purgatives are useful, in acute hepatitis, both, by their revulsive action, and by the depletion they indirectly produce from the portal veins. Mercurials are especially indicated, in consequence of their property of increasing the hepatic secretion, and thereby directly unloading the congested vessels of the liver. From five to fifteen grains of calomel should be given at the commencement of the treatment, and followed in a short time by one of the saline cathartics, or by the infusion of senna with salts. In the cases of individuals liable to suffer great irritation of stomach and bowels from calomel, an equivalent quantity of the mercurial pill may be substituted. Sometimes it may be proper to administer the mercurial in connection with a quicker cathartic, as jalap, scammony, &c.; but this plan is often forbidden by irritability of the stomach. Calomel in smaller doses, from one to three grains, for example, may afterwards be given at bedtime, and followed in the morning by a saline aperient, so as to have the bowels well opened every day. The saline cathartics should be largely diluted with water, so as to render them as little irritant as possible. It will often be found advantageous, when the first violence of the inflammatory excitement has been subdued by depletion, or earlier in cases not requiring depletion, to combine with the calomel at night a grain of opium, and, if there is no irritability of stomach, an equal or double quantity of ipecacuanha. By this plan pain and irritation are allayed, the patient rests at night, and the secretory function of the liver is sustained; while, at the same time, the foundation is laid for a full mercurial course, should the disease not appear disposed to yield without it.

Should the skin be hot and dry, and the stomach not irritable, tartar emetic in solution may be given in small doses, at short intervals, alone, or combined with nitre or the neutral mixture. Should the patient be affected with nausea or vomiting, the effervescing draught would be preferable as a refrigerant diaphoretic. Under the same circumstances, the Seidlitz powder will be found useful as an aperient; and, if no indication exist either for diaphoresis or purging, the sickness of stomach may be controlled by small draughts of carbonic acid water, and external fomentations or revulsives.

When depletion, along with the measures proposed, fails to subdue the inflammation, the mercurial impression should be unhesitatingly resorted to. In ordinary cases, it is unnecessary to do more than to produce a very slight effect upon the gums. For this purpose, the calomel, before given only at night, may be repeated in smaller doses, say from half a grain to a grain, every two, three, or four hours, until it begins to produce some obvious effect upon the mouth; or the mercurial pill may be substituted in double or triple the dose. When the mouth is affected, the remedy should be omitted for a time, and resumed when found necessary to sustain the impression, which should be continued until all signs of the inflammation are subdued, or until it shall be found that mercury is inadequate to this effect. When the stomach and bowels do not bear the mercurial well, or the system resists its influence, recourse may be had to the external use of mercurial ointment.

In severe and rapid cases of the disease, such as are apt to occur in tropical countries, the remedial means must be proportionably more energetic. In these, calomel may be given more freely as a cathartic, and afterwards pushed more speedily in reference to its general effects upon the system; while its operation is aided by mercurial frictions or dressings. In common hepatitis of an acute or subacute character, two or three days or more may be given to the depletory method, before attempting to establish the general influence of mercury; in the more alarming cases, the two plans should be carried into effect simultaneously.

While the measures already mentioned are in operation, they should be assisted, in the early stages, by fomentations or poultices to the side, and, after the violence of the inflammatory excitement has subsided under the lancet and purgation, by large blisters. These, in connection with mercury, often serve to complete the cure, and prevent the passing of the disease into the chronic state. Advantage will often accrue from a more or less frequent repetition of the blister, one being allowed to heal before another is produced. It may sometimes be advisable to dress the blistered surface with mercurial ointment.

Should evidence of suppuration be presented, both the depletory and mercurial plans should be omitted, or at least very much relaxed. The indications now are to hasten the suppurating process, to favour its tendency to the surface, and to support the general strength. If any advantageous specific influence over the liver can be substituted for the mercurial, which would now be too exhausting, it should also be resorted to. These indications are best met by the nitromuriatic acid, which operates both as a tonic, and an hepatic alterative, and by emollient cataplasms to the side; while irritation is calmed by opiates, or other narcotics, as hyoscyamus and conium. In many cases, it will be advisable to superadd the use of quinia and the fermented liquors. Recourse may also be had to other mineral acids, as the nitric, sulphuric, and muriatic, in order to vary the tonic impression.

In the early stages, the patient should be allowed cooling drinks, and confined to a very low diet, consisting chiefly of farinaceous and mucilaginous liquids. As convalescence advances, the diet may be gradually improved as in other inflammatory affections. During suppuration, also, it is often necessary to allow the patient nutritious food, such as preparations of milk, broths, soft-boiled eggs, oysters, &c., in order to sustain the strength.

Chronic hepatitis requires a somewhat modified treatment. This is essentially the same, whether the complaint is a mere residue of an acute attack, or was originally of the chronic form. General bleeding is now seldom necessary or admissible; but occasional advantage may be derived from local depletion by cups or leeches. Our main reliance, however, so far as medicines are concerned, must be upon a *moderate* mercurial course, sustained for *a considerable time*. It is highly important that both these conditions should be attended to. Merely to salivate, and then to suspend the mercurial, is altogether insufficient to remove a disease, often of long standing, and attended with great organic derangement. A powerful impression will exhaust the strength of the system, and render a continuance of the treatment impossible, while the effect produced is partial and temporary. Many of the failures in the treatment of chronic hepatitis are probably owing to a too energetic employment of mercurials in the first place, and a too hasty abandonment of them under slight discouragements. The least effect on the gums is sufficient; and even this is desirable only as a proof that the mercurial is acting, and may be very properly dispensed with, if the disease appear to be going on favourably without it. The mercurial or blue pill is decidedly the most suitable of the mercurials in this case. It should be given in small doses, repeated several times a day, and combined or not, according to the circumstances of the case, with other medicines. Thus, should the bowels be constipated, it may be given with rhubarb, or aloes, or both; should they be too loose, with opium or small doses of Dover's powder, and sometimes with one of the cretaceous preparations, where there are symptoms of acid in the stomach and bowels; and, should the digestion be feeble, with extract of gentian or quassia, or small doses of sulphate of quinia. Should opium be contraindicated, and the patient complain of pain, restlessness, or other form of nervous irritation, conium, hyoscyamus, or stramonium may be combined with the mercurial. Sometimes it may be better to use very small doses of calomel, or even to depend upon mercurial frictions, especially when the stomach and bowels are very irritable. A mercurial plaster worn constantly on the side will be found a useful remedy in some very susceptible constitutions, and may be used as an adjuvant in any case, when the side is not otherwise occupied. The impression on the system should be maintained for weeks or months, if the patient appear on the whole to improve under it; care being always taken, if the mouth should be inadvertently made decidedly sore, to suspend the remedy until this inconvenience has been removed.

During the mercurial course, revulsion to the side should be made by rubefacients, repeated blisters, pustulation with croton oil or tartar emetic, setons, or issues, according to the severity of the symptoms. When the liver is enlarged and indurated, advantage may be expected from frictions over the side with iodine ointment, repeated daily or twice a day, and long continued.

Should the mercurial plan fail, or circumstances forbid its use, nitromuriatic acid should then be employed both internally, and externally by pediluvium, general bath, or lotion to the side. The two remedies, however, should never be administered at the same time internally, as they are chemically incompatible, and might produce serious mischief. The same adjuvants may be given, if requisite, with the nitromuriatic acid as with mercury. The former remedy is especially adapted to cases in which suppuration has commenced, and in which the mercurials should not be given, at least as a general rule.

Other alteratives have enjoyed more or less reputation in the treatment of chronic hepatitis. Perhaps one of the most highly esteemed is taraxacum. This may be given as an adjuvant to the mercury or nitromuriatic acid, and, in consequence of its aperient and slightly diuretic properties, is especially adapted to cases in which there is a tendency to constipation, and to dropsical effusion. The alkaline carbonates sometimes appear to exercise a happy influence over disordered hepatic actions, and alkaline baths have been highly recommended. Some German practitioners have confidence also in the alterative properties of muriate of ammonia; and iodide of potassium may be used, with good hopes of benefit, when the organ is considerably enlarged.

Attention, throughout the treatment, should be paid to the state of the stomach, bowels, and skin, which should be kept in as healthy a condition as possible. (See *Dyspepsia, Diarrhœa, Constipation, &c.*)

The regulation of the diet is highly important. Without being stimulant, it should in general be nutritious and easily digestible. Milk and farinaceous substances, with a moderate allowance of the lighter kinds of animal food, especially of boiled meats or poultry, are generally admissible. But the physician should modify the regimen, according to the greater or less degree of inflammatory excitement or general debility.

Moderate exercise of the passive kind is often useful; but fatigue, or violent exercise calculated to agitate the liver, as riding on horseback or in a rough vehicle, should be avoided.

Among the most efficient remedies in chronic hepatitis is a change of climate. After failure by medical treatment, if the patient reside within the tropics, he should be sent to some mountainous region, or colder latitude; if in a city or miasmatic district, within temperate latitudes, to some cool, elevated, and healthy spot, which experience has proved to be favourable, or to the sea-shore, which is almost always salutary in such cases.

Many natural mineral waters have enjoyed some reputation in the cure of chronic hepatitis, and probably co-operate with the exercise, pure air, cheerful society, and exemption from cares, incident to watering-places, in producing a favourable impression. The waters of Vichy in France, Cheltenham in England, and Saratoga in this country, have been especially recommended. The combination of chalybeate and aperient properties should be sought for, when the stomach is feeble, and the bowels costive. In a different state of the bowels, the purer chalybeate springs may be preferred. Advantage has also undoubtedly accrued, in chronic liver affections, from the sulphur springs, such as those found in the interior of Virginia, Kentucky, and New York. These may be employed both internally and externally. In reference to the former mode, it is necessary to be careful that no phlogosis of stomach, or general inflammatory excitement, exist. The hot springs of Virginia have also been found very useful, employed in the form of bath.

In cases of *abscess of the liver*, advantage may sometimes be derived from an artificial opening; but care should be observed that the abscess is sufficiently advanced; and the operation should not be performed, unless there is good reason for believing that adhesion has taken place between the peritoneum of the liver and that of the abdominal parietes; as otherwise the pus might escape into the cavity, and occasion fatal peritonitis. When evident fluctuation is presented, the integuments obviously thinned, and the skin over the tumour reddened, it may be inferred that adhesion has taken place; and a trochar or lancet may be safely introduced. Plans have been proposed to effect the desired adhesion, when it is doubtful, by the application of caustic, and by incision through the parietes. It appears, however, from dissections, that these plans have frequently failed. Mr. Twining, who often opened hepatic abscesses by caustic, states that, upon examination after death, adhesion of the peritoneal surfaces had very rarely been found. Dr. Graves proposed incision through the integuments over the tumour, the division of some layers of muscle, and afterwards stuffing the wound with lint. But neither has experience shown this method to be effectual. A plan proposed by M. Begin, is to cut down to the peritoneum, open this carefully, as in the operation for hernia, and then, if adhesion be found not to have taken place already, to apply common dressings to the wound in the hope that the consequent inflammation may lead to the requisite consolidation of parts. The late Dr. Horner, of the University of Pennsylvania, in an operation for opening an hepatic abscess, having found a want of adhesion upon cutting through the abdominal parietes, stitched the liver to the side by means of a crooked needle armed with a kid-skin ligature, and then plunged a trochar and canula into the abscess. No signs of peritonitis followed, and, though the patient died, apparently in consequence of the previous exhaustion, yet, upon examination after death, adhesion was discovered immediately around the wound, which had proved sufficient to prevent the entrance of pus into the abdominal cavity (*Am. Journ. of Med. Sci.*, xiv. 87.) Perhaps the dangers of the want of adhesion have been somewhat exaggerated. Dr. Thompson states that, in the cases on record in which hepatic abscesses have been opened, though there is reason to believe that in many of them there was no adhesion, yet there is no evidence of the pus having, in any one case, entered the abdominal cavity; and Dr. Murray expressly declares, in the *Madras Quarterly Medical Journal* (July, 1839), that he has opened many hepatic abscesses, in which there was no adhesion between the liver and abdominal parietes, and that in none did any matter escape into the peritoneal cavity after the operation. (*Dis. of the Liv and Bil. Passages*, by Wm. Thompson, M.D.) Two modes of opening the abscess have been proposed, one by caustic potassa, the other by a cutting instrument. The latter is now almost universally preferred. A trochar and canula may be employed; but sometimes the contents of the abscess are so thick that they will not readily flow out through the instrument, in which case, a larger opening may be made by the knife. Dr. Budd has suggested a danger from opening abscesses, which had previously scarcely been taken into account. The substance of the liver being firm, the walls of the abscess may not collapse when the pus is evacuated; air consequently enters; and the pus, undergoing decomposition, becomes acrid and thus tends to sustain irritation in the organ. (*Diseases of the Liver*, 2d ed., p. 116.) This is less an objection to the opening of the abscess, than to any subsequent measure for forcing out the pus to a greater extent than would be spontaneously effected by the collapse or contraction of the surrounding tissues. On the whole, the present opinion of the profession seems to be less favourable than formerly to this operation. Out of 81 cases in which abscess of the liver has been opened in India, there had been, according to Mr. E. J. Waring, 15 recoveries and 66 deaths; the average duration of life after the operation was eighteen days; and in no case of recovery was there complication with dysentery. (*B. and F. Med.-chirurg. Rev.*, July, 1855, p. 8.) The existence of dysentery, therefore, affords a contraindication to the operation; and Mr. Waring thinks that one frequent cause of its failure is the presence of multiple abscesses in the liver. Mr. J. R. Martin, who has had opportunities of practical observation, states that he has often seen the operation performed in India, and has himself performed it, but in no instance has seen it of real benefit. (*Ibid.*, July, 1856, p. 101.) Dr. John Jackson, who writes of his experience in India, states that in all the cases in which he has known the opening to be made in the intercostal spaces, he has witnessed no recovery and advises that the operation should be confined to instances in which the abscess should seem of limited extent, and show signs of pointing. The operation is more successful in the natives than Europeans, because the abscess in the former is more apt to be small and superficial. Of nine cases of operation under his care, in natives, eight were successful, while a favourable result in Europeans was very rare. (*Lancet*, Aug. 1859, p. 156.) A fair inference is, that abscesses should be opened only under circumstances offering very clear indications for the operation.*

Article II.

NON-INFLAMMATORY ORGANIC DISEASES OF THE LIVER.

THESE are very numerous, and generally difficult, often impossible to distinguish from chronic inflammation during life. They are, indeed, very frequently attended by inflammation in their course, masking, in some degree, any peculiar phenomena by which they may be characterized. It is not improbable that some of them have their origin, at least occasionally, in the inflammatory process or its results. In most of them, the only treatment, from which any good is to be expected, is some modification of that adapted to chronic hepatitis. It would seem, therefore, that no great practical benefit could accrue from their distinct consideration. In the formation, however, of a just prognosis in hepatic affections, they must be taken into account; and even the partial knowledge of them we may possess may lead to some modification of the treatment, founded upon the impossibility of ultimate success. It will be proper, therefore, to give a brief sketch of such of them as have been well ascertained. It may be observed, in general, that, in consequence of their interference with the functions of the liver and the free flow of blood through that organ, they necessarily give rise to the same phenomena as those resulting from inflammatory disorganization, such as stomachic and intestinal derangement; a frequently jaundiced colour of the skin, eyes, and secretions; mental depression, heaviness, stupor, and other marks of cerebral oppression; and finally dropsical effusion, either general, or exclusively abdominal. With the exception of cancerous formations, they are attended with little or no pain; and, when pain does occur, it is of an obtuse character, and probably dependent in general upon the development of inflammation. Of course those of them which are attended with enlargement of the liver, give rise to all those signs of pulmonary oppression, cardiac derangement, and disorder of the abdominal viscera, which result from mechanical encroachment upon the two great cavities, and compression of their contents. An interesting fact in relation to these non-inflammatory organic affections is, that they are proportionally much more common in temperate than hot climates; so that they do not appear to be subject to the same kind of causalty as common hepatitis.

Hypertrophy.—This is an overgrowth of the liver, consequent upon an increase of its proper structure, and entirely independent of inflammatory depositions, or the development of new and accidental tissues or products. It may affect a part or the whole of the organ, giving rise, in the former case, to great alteration of its form. It is probably most common in children, from the circumstance that the excessive nutrition of the liver, which constitutes its normal state in the fœtus, may not be diminished in the due proportion after birth, so that the viscus may retain in a greater or less degree its original preponderance. It is rare in such a degree as to be considered morbid. There is no symptom by which it can be certainly distinguished, during life, from other cases of enlargement of the liver.

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* For some very sensible observations, the result of ample experience on the subject of hepatic abscess and its treatment, the reader is referred to a paper by Dr. C. Morehead, in the *Lancet*, May 20, 1865, p. 580. (*Note to the sixth edition.*)

Atrophy.—This is exactly the reverse of the preceding affection, being characterized by a diminution of the natural structure of the organ, so as to leave its several constituents in their due proportion and relation; a condition such as might result from defective nutrition, or too active interstitial absorption. Every case of shrinking of the liver is not one of atrophy; for the texture may be merely condensed, and the weight greater even than in health. In true atrophy, both the bulk and weight are diminished. It is said that the characteristic structure of the liver sometimes suffers atrophy, while the areolar tissue is increased; so that there is no diminution of bulk. Cases are on record, in which the liver has been reduced to the size of the fist. An accurate diagnosis of this affection during life is not possible. Percussion will demonstrate the diminished volume of the liver; but will not enable us to distinguish the disease from cirrhosis, or other affection accompanied with an altered structure, as well as lessened bulk of the organ. In its higher grades it is uniformly fatal; the symptoms which precede death being the same as those which, in other diseases of the liver, arise from a suspension of its functions.

Induration.—The liver often acquires increased density and hardness from depositions or new formations in its substance; but it occasionally also undergoes an induration of its parenchyma without such cause, and without other observable change. In such instances, it is firmer to the touch than in health, is torn with greater difficulty, and yields a sound under the scalpel. The hardness may be connected with increased or diminished bulk of the liver; but the latter is much the more common of the two. It may be either general or partial. It is observed most frequently as a complication of other affections, and may possibly result from long-continued irritation, approaching but not reaching the inflammatory state. It cannot be distinguished during life from hardness proceeding from other causes.

Softening.—This is a frequent result of inflammatory action; but it may also occur without that cause. Louis describes a variety of softening, observed by him in typhoid fever, which he designates by the term *friability*. The liver breaks with the slightest force, and crumbles, as it were, into a sort of powdery mass. Another kind, which may be distinguished as the moist softening, is marked, in extreme cases, by a pasty or semi-liquid consistence of the liver, the organization of which is completely destroyed in the affected part, but without the offensive odour of gangrene. Softening may or may not be attended with signs of congestion. Sometimes the liver has merely an increased flaccidity, being throughout as soft as the spleen. This condition was noticed by Dr. Baillie, especially in old people.

Cirrhosis.—Granular Degeneration of the Liver.—This affection was described by Dr. Baillie under the name of "*common tubercle of the liver.*" It was afterwards investigated by Laennec, who named it *cirrhosis* (from κιρρος, yellow), in accordance with his peculiar views of its nature. It consists in the development, upon the surface and through the substance of the liver, of innumerable corpuscles, of various sizes, from that of a pin's head to that of a hazelnut, or even larger. The viscus is usually diminished in bulk, sometimes considerably so; is harder and denser than in health, and rough upon the surface, in consequence of the projection of these little bodies, and the shrinking of the surface between them. In some instances, the bulk of the liver, instead of being diminished, is even increased, and its substance softer instead of firmer than in health. This is supposed to be the first stage of the affection; and, in cases of the kind, I have noticed that the corpuscles, or rather morbid subdivisions of the gland, are much larger than when the liver is smaller and firmer. The colour of the corpuscles is yellow of different tints, sometimes a bright canary-yellow, sometimes brownish or greenish, and occasionally of a reddish hue; and, when pressed upon white paper, they impart to it a yellow stain. When the liver is cut, the surface, at first sight, appears uniform and yellow or brownish-yellow, but, more closely examined, is found to be studded with these minute bodies in countless numbers. According to Cruveilhier, each corpuscle, as observed upon the surface, is distinct, with its own investing membrane, and connected with the other parts only by a vascular foot-stalk; and a similar distinctness of position exists in the interior of the viscus.

Very different views have been taken of the nature of the affection. Laennec considered the corpuscles to consist of a peculiar accidental product, somewhat analogous to tubercle, and, like that, capable of being softened, and converted ultimately into a greenish-brown, inodorous, and somewhat adhesive mass. Others have viewed them as resulting from alteration of the proper structure of the liver, or of one of its constituents. It was at one time thought by anatomists that the liver consisted of two substances: "one apparently formed by the ramification of the capillary vessels, and presenting a reddish appearance, the other yellowish-white, and supposed to be chiefly concerned in the secretion of the bile." In accordance with this notion, Bouillaud maintained that the corpuscles were nothing more than the secretory granules of the liver, undergoing gradual organic change, in consequence of the obliteration of the vascular plexus, and the interruption thus offered to the hepatic circulation. Andral also stated his belief that they were the hypertrophied yellow constituent of the liver, predominating over the atrophied red constituent. But, after this double constitution of the liver was disproved by the investigations of Mr. Kiernan, it became necessary to resort to another hypothesis; and Cruveilhier suggested that cirrhosis might consist in an excessive development of a portion of the granules of the liver, consequent upon atrophy of the remainder. According to Dr. Carswell, the disease is essentially atrophy of the lobular structure, produced by a contractile fibrous tissue, originating in inflammation of the capsule of Glisson, which is the areolar envelope surrounding the blood-vessels of the liver, and ramifying with them through the viscus. Something like this is an opinion prevalent among English pathologists. They conceive that a fibrous tissue has formed in the spaces occupied by the blood-vessels and areolar tissue around the acini, which may be seen, in the section of the liver, forming white lines around the granules, and which by its contraction causes compression of the secretory cells, and general atrophy of the liver. By some this fibrous matter is considered as the result of inflammation, by others as an abnormal product, originating in a peculiar non-inflammatory exudation, which may be placed in the same category with the tuberculous, the atheromatous, and cancerous formations, though possessed of distinct characters of its own. This view is ingeniously maintained by Dr. Handfield Jones, who designates the formation as a fibroid degeneration, closely analogous to what is frequently seen in blood-vessels and other parts, and called cartilaginous degeneration, from its cartilage-like appearance. (*B. and F. Medico-chir. Rev.*, July, 1854, p. 28.) Against the opinion of Laennec are the facts, first, that each morbid corpuscle, as stated by Cruveilhier, when cut through, exhibits under the microscope the same arrangement as the healthy parenchyma, and, secondly, that the granules appear to be capable of secreting bile, as the quantity of this liquid produced in cirrhosis is often scarcely less than in health. The opinions based upon the double structure of the liver are now entertained by few. That the affection is not essentially inflammatory follows, I think, from its course, and the utter inefficiency of antiphlogistic measures in its cure. The hypothesis which ascribes it to the formation of a new fibroid tissue, or a degeneration in character with increase in quantity of the normal interlobular areolar tissue, is plausible; and there can, I think, be no doubt, that such an abnormal condition exists in most cases; but there are difficulties in the way of this explanation, and among them the facts, that around many of the corpuscles no confining or compressing tissue can be detected, and that instead of being compressed, the affected acini seem to be enlarged. Indeed, in the present state of our knowledge, it seems to me that any view which can be taken must be regarded as conjectural.* Cirrhosis is sometimes associated with fatty or waxy degeneration, and sometimes exists without either.

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* In order to understand the nature of cirrhosis, it is necessary to be acquainted with the intimate structure of the liver. That viscus consists essentially of an aggregation of minute lobules, called *acini*, separated from each other by areolar tissue, through which pass the branches of the portal vein and hepatic artery conveying blood to the acini, as well as those of the hepatic vein and the biliferous tubes which carry the blood and the bile from them. In these acini are performed the offices of the liver, the secretion, namely, of the bile, and the preparation of the blood brought by the portal vein for the purposes of the general economy.

According to the researches of Mr. Kiernan, of London, and of Dr. Joseph Leidy, of Philadelphia, these acini are made up chiefly of a network of minute tubes, consisting of a basement membrane, lined internally with epithelial cells, the arrangement of which was first demonstrated by Dr. Leidy. Dr. L. S. Beale, however, who has examined the structure of the liver with great care, thinks that the cells are not attached to the tubes of basement membrane, but lie loose within their cavity. (*Med. Times and Gas.*, July, 1856, p. 84.) Between and around these tubules ramify minute branches of the portal vein and hepatic artery; while, in the centre of each acinus, a branch of the hepatic vein arises, which receives the blood after it has been submitted to the secretory and elaborative action of the cells, and carries it into the vena cava. It is believed that, as in other secretory functions, the epithelial cells of these tubules are the real agents by which the secretion of bile is effected, and the blood rendered fit for its purposes in the system.

The most probable explanation of cirrhosis appears to me to be, that the cell-action is disordered, the cells themselves being abnormally multiplied, and at the same time congested with abnormal matter derived from the blood. The tubules are thus distended, and the bulk of the acini greatly increased; while the vascular ramifications within the latter, being unduly compressed, are probably in a greater or less degree obliterated. The enlarged acini, pressing upon others either less diseased than themselves, or altogether undiseased, cause their absorption; while the areolar tissue surrounding the several absorbed acini becomes consolidated about those which are hypertrophied, thus giving rise to the fibrous structure which separates and isolates the little bodies, and which has been taken for a product of inflammation or of abnormal exudation. In this condition. the liver, as is believed to be the case, may be enlarged and soft in the early stage, while the corpuscles themselves are often of considerable magnitude. But, the blood-vessels being gradually obliterated by the pressure of the enlarged acini, cease to supply to these sufficient blood to support their hypertrophied condition. They consequently shrink more and more, and the whole organ becomes at length much diminished, and at the same time hardened. It must be admitted, however, that this view is like the others quite hypothetical; and I cannot but think that there are cases in which there is a formation of new or abnormal fibrous tissue, constituting a proper fibroid degeneration; and that this at least participates in the general result. The two conditions in which the liver is found in this disease, one contracted and firm, the other large and soft, one with small granules, the other with large, and which, though by some thought to be different states of the same disease, are by others considered quite distinct, give some countenance to this notion of the double origin of the affection.

The flow of blood through the organ is impeded, the secretion of bile is diminished, and congestion of the portal circle with consequent abdominal dropsy takes place; while, the blood which passes into the vena cava not being duly elaborated, the whole system suffers. As the liver elaborates a peculiar amyloid substance, probably important towards the constitution of the blood, and is supposed also to produce fat and fibrin for purposes of nutrition, these functions must suffer in cirrhosis, which thus interferes with the general health.

Intemperance is thought to be one of the most common causes of this disease. With the views above given, this is easily explained. Alcohol taken into the stomach enters into the portal vein, and is first distributed through the liver, which, therefore, feels the full force of its stimulation. The secretory epithelial cells are excited by it into inordinate action, undergo in consequence excessive multiplication, and, not being washed away like the analogous diseased cells in the kidneys by a current of watery fluid, necessarily accumulate in their tubules, with all the results which have been above referred to as characterizing the disease under consideration. (*Note to the third, fourth, fifth, and sixth editions.*)

The symptoms of cirrhosis are not strongly marked, and its existence is in general rather to be inferred by the way of exclusion, than to be positively demonstrated. There may be some dull pain or sense of discomfort in the region of the liver; but often there is none, and pressure occasions no uneasiness. When, along with the ordinary accompaniments of disordered hepatic function, such as more or less yellowness of skin or urine, gastric and intestinal derangement, depression of spirits, &c., there are also abdominal dropsy, either without or preceding external œdema, and a diminished bulk of the liver, evident upon percussion, we have every reason to think that cirrhosis exists, especially if the symptoms have obstinately resisted all the remediate measures, or, if relieved for a time, have again returned with equal force. Should the liver be within reach of the touch, as sometimes happens when a full inspiration is taken, so as to depress the viscus below the edge of the ribs, and should the surface then have a rough granular feel, the existence of the disease may be considered as almost certain. Sometimes a friction sound may be heard, arising from the rubbing of the rough surface against the walls of the abdomen. The characteristic phenomena, it thus appears, are abdominal dropsy, exclusive or original, a diminished size of the liver, and a granular state of the surface. The disease may exist without these characters, but cannot then be recognized with an approach to certainty. In consequence of the impeded circulation through the liver, and resulting portal congestion, there is sometimes enlargement of the superficial veins of the abdomen, and the patient is, in some cases, affected with occasional attacks of hemorrhage from the stomach and bowels.* The hæmatemesis, though by no means a uniform attendant on this disease, is sometimes very copious, contributing greatly to the exhaustion of the patient, and has even been known to be the immediate cause of death. The duration of the disease is uncertain, as it is difficult to ascertain the precise period of commencement. It may end in a few months, or last a year or more. So far as known, its termination is uniformly fatal. Towards the close of the disease, the pulse, before nearly natural, becomes frequent and irregular; the skin, usually dry and of the natural temperature, becomes cold; emaciation takes place, some œdema of the lower limbs is observed, the strength utterly fails, and the patient dies of debility, evincing usually before death more or less mental disorder.

Little is known of its cause. It often occurs in drunkards, but is by no means confined to that class of persons; and a considerable proportion of the patients who have come under my own notice have been of temperate habits. The case of a girl five years old is recorded, who had been attacked in her fourth year, and who had always shown a strong repugnance to alcoholic drinks. The affection is apt to be coincident with granular disease of the kidneys.

In regard to its treatment nothing more satisfactory can be said than of its causes. So far as is known it is a necessarily fatal disease; but it may very possibly have happened that cases have yielded to treatment in their earlier stages, without the nature of the complaint being recognized. It is proper always to combat the symptoms, as they appear, by such means as are usually employed for similar symptoms in other hepatic complaints; as, for example, in chronic inflammation. Cirrhosis is one of the most common of the fatal diseases of the liver in temperate climates.

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* One of the inquiries, suggested by the suppression of the capillary circulation of the portal vein in this disease, is what course the blood of the vein takes in reaching the general circulation. According to M. Sappey, of Paris, one of the small veins in the suspensory ligament becomes enlarged, and serves as a channel to anastomosing vessels upon the surface of the abdomen, through which the blood descends to the crural vein, and thus is brought into the general course towards the right cavities of the heart. The anastomosing veins referred to may be beneath the fascia of the abdomen, or subcutaneous; and, in the latter case, visible varicose tumours are developed. In both, the downward venous current produces a thrill perceptible to the hand, and a murmur with the stethoscope; and these may be considered as diagnostic of the very probable existence of an old cirrhosis; while in one sense they are favourable, as they show that the portal congestion is relieved, and consequently the occurrence of ascites and gastric hemorrhage less probable. (*Ed. Med. Journ.*, April, 1859, p. 938.)—*Note to the sixth edition.*

Fatty Liver.—There appear to be two forms of fatty liver, one in which oil accumulates in the organ from over-production, as in the liver of the goose when over-fed, the other in which it takes the place of the healthy tissue. The latter is the true fatty degeneration. Dr. Hanfield Jones states that, in the former, the oil globules are found in excess within and without the cells, being everywhere distributed through the liver; in the latter the oil drops are not in distinct cells, nor generally distributed, but are confined to the margin of the lobules, where they appear to have replaced the cells. Another important distinction, noticed by the same observer, is that sugar was found in the merely over-fat liver, while none could be detected in that in which the true fatty degeneration had taken place; showing that the function is destroyed in the latter, but not necessarily in the former. (*Medico-chirurg. Trans.*, xxxv. 249.) Yet we know of no external marks by which they can be distinguished.

In the adipose degeneration of the liver, this viscus is usually, though not always enlarged, and sometimes is very much so. It has been known to fill almost the whole abdominal cavity. The weight is not increased in a degree corresponding to the enlargement. The characteristic hue of the fatty liver is a pale-yellow or cream colour, diversified by brownish, deep-orange, or reddish spots or points. The organ is generally softer than in health, but not always, and it is said sometimes even to be harder. When cut, it has a brownish or pale-yellow colour, which is usually modified by innumerable red points. It has an unctuous feel between the fingers, greases the knife, makes a greasy stain on bibulous paper, and, when heated moderately, furnishes much oily matter. The augmentation of volume probably depends upon the great amount of oily deposit. Along with this there is atrophy of other portions of the parenchyma, depending probably in part on oleaginous conversion, and in part upon pressure. Sometimes the deposit of fatty matter is partial. We have no means of forming an accurate diagnosis of this complaint. It may be suspected when the liver is considerably enlarged in phthisis, or in Bright's disease, without the attendant pain and tenderness of inflammation. The causes are quite as obscure as the diagnosis. From the well-known effect of close confinement and excessive feeding in developing fatty matter, with enormous increase in bulk, in the liver of the goose, it might be suspected that the same causes are capable of producing the disease under consideration in man. But we have no positive proof to that effect. Fatty liver is frequent in phthisis, and exists in other chronic complaints, especially Bright's disease. Louis found it in one out of three of all the cases of phthisis which he examined after death; and of 49 cases of fatty liver which he observed in the course of three years, 47 occurred in consumptive patients. According to the same observer, it is much more frequent in women than in men. Dr. George Johnson states that of 21 cases of fatty liver observed by him, 17 occurred in combination with fatty degeneration of the kidney, which is the ordinary chronic form of Bright's disease. (*Medico-chirurg. Trans*, xxix. 12.) Nothing satisfactory can be said of its treatment. An obvious inference from what has been stated would be, that, in individuals suspected to have this complaint, sedentary habits and over-eating, especially of food containing oily matter, should be avoided. Nevertheless, I am disposed to think that cod-liver oil may prove beneficial by favourably modifying the nutritive function in the liver.*

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* Virchow maintains that there is no essential difference between the physiological and pathological fatty liver, that in the latter the cells are never destroyed, as in true fatty degeneration, though filled with oil; and consequently that fatty liver is not irremediable. (*Cell. Pathol.*, Am. ed., p. 373.) But, in the face of all the observations hitherto made, tending to show that the normal structure has really undergone degeneration,

Waxy Liver.—*Brawny Liver.*—*Scrofulous Liver.*—*Lardaceous Liver.*—This has usually been considered a variety of fatty liver, and not unfrequently been confounded with it. Pathologists now believe it to be the result of a peculiar degeneration or deposition, having no resemblance whatever to fatty matter. It was at first specially examined by Dr. Geo. Budd (*Diseases of the Liver*, 2d. ed., p. 304), and by Dr. W. T. Gairdner (*Ed. Monthly Journ. of Med. Sci.*, Feb. 1854. p. 186), but has of late attracted the attention of pathologists generally. The liver is much enlarged, sometimes enormously so, and at the same time denser than in health It is usually pale or fawn-coloured, but sometimes red from congestion, and sometimes mottled. It is of a tough texture, and when cut presents a uniform, compact, smooth, somewhat shining or translucent surface, pale or yellowish, and not unlike bacon rind or yellow wax, both of which have given it names. Under the microscope, the entire structure seems to have been changed, and the epithelial cells appear compressed, irregular, with atrophied nuclei, and sometimes aggregated in masses. The affection has been noticed especially in scrofulous or syphilitic patients, and, according to Dr. Gairdner, is the most frequent hepatic lesion in phthisis, more so even than the fatty liver, with which it appears to have been confounded by Louis. The two conditions, however, sometimes coexist in the same liver. Patients affected with caries or necrosis are said to be peculiarly liable to it. Though most frequently an accompaniment of the diseases mentioned, it sometimes occurs originally, and so far as known without complication. Hypertrophied livers are very frequently of this lardaceous character. Notwithstanding the extent of disease in the organ, there is often no deficiency of bile, and the chief inconvenience arises from its bulk and consequent pressure. The patient usually dies of other coincident diseases. For the peculiar chemical and microscopic characters of the matter generated in this disease, the reader is referred to the subject of waxy or lardaceous degeneration in the first volume of this work (*page* 88).

Nutmeg Liver.—This name has been applied to the liver, when it exhibits, in its cut surface, a veined appearance, produced by two distinct colours conspicuously intermingled, as seen in the section of a nutmeg. These colours are usually red and yellowish or whitish, and are owing, the former to sanguineous congestion, the latter probably to the impermeability of portions of the tissue, from destruction or occlusion of the blood-vessels. The limits of the colours are often well defined, and the contrast not unfrequently striking. The condition does not depend on any one lesion, but may result from whatever produces degeneration of the tissue in closely neighbouring minute sections, irregularly intermingled with unaltered parts. The degeneration may be fatty, or waxy, or possibly fibroid; and hence the nutmeg liver may belong to either of these affections. The colours are most strikingly contrasted when circumstances exist which produce intense venous congestion. The most marked case of the kind which I have seen, occurred in the winter of 1854–5 in the Pennsylvania Hospital, in a drunkard who died of disease of the heart, with insufficiency of the mitral valves, great dilatation of the right ventricle, distended and throbbing jugulars, and universal venous congestion. The liver was somewhat enlarged, dense, tough, of a blackish redness externally, and intense venous redness upon its cut surface, beautifully veined everywhere with a fine distinct yellowness. There was no fatty feel, nor greasy appearance on the knife; and, when a small portion of the yellow matter was scooped out and examined under the microscope, it exhibited masses of irregular cells, contain-

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while his opinion may be correct in relation to many cases of fatty liver, in which the condition is mainly that of obesity of the organ, as in the liver of an over-fed goose, yet it is wholly untenable in many others, in which the organ has undergone the same pathological change as characterizes fatty degeneration in the kidneys, heart, brain, &c. (*Note to the sixth edition.*)

ing granular matter, either without visible nuclei, or with indistinct ones; the condition ascribed to the cells of the waxy liver, of which I have no doubt this was a commencing example.

Tubercles.—This term is employed here, as in general elsewhere in this work, exclusively to designate that morbid deposit which, when existing in the lungs, constitutes genuine phthisis. Tumours are occasionally found in the liver, having all the proper tuberculous characters, and in all the different stages. Such tumours have been described by Portal and Baillie. Cruveilhier, however, never saw tubercles in the livers of adults affected with phthisis or tuberculous disease of the abdomen; and Louis observed only two instances in the numerous cases of phthisis which he dissected. They must, therefore, be considered as comparatively rare. But, according to Cruveilhier, it is not uncommon to find in the livers of tuberculous children thousands of minute, hard, semi-transparent granules, like millet-seed; and I have myself examined the liver of an adult, dead of pulmonary consumption, the cut surface of which appeared completely studded with minute, oval, hard, translucent corpuscles, which could be readily isolated from the parenchyma in which they were embedded, and bore an exact resemblance to the miliary tubercles of the lungs.

Serous Cysts and Hydatids.—Cysts containing watery fluid have frequently been observed in the liver. These are of two kinds, one consisting of a single sac or serous cyst, the other of a sac containing within it one or more additional sacs. The former variety is a mere derangement of the natural structure, the latter is supposed to be a distinct organization, a peculiar kind of parasitic animal, to which the name of hydatid or *acephalocyst* has been given. The proper *serous cyst* is very rare. It has, however, been found both in the interior and upon the surface of the liver, in the latter case sometimes partially embedded in its substance. There may be only one, or several may exist at the same time; and sometimes the liver appears as if converted into cysts, filling its whole structure. This, however, is extremely rare. The cysts are of various sizes, and sometimes very large. When upon the surface, they may break, and occasion fatal peritonitis by the escape of their contents. They are liable to become inflamed, to suppurate, and thus to be converted into abscesses. Their origin is uncertain.

Hydatids are not unfrequent. They are, indeed, more common in the liver than in any other organ. The cyst which contains them is often thick and fibrous, and is probably the product of inflammation excited by the presence of the parasitic body. From one to four of these cysts have been found at the same time in the liver, which is usually enlarged, though not necessarily so. Sometimes, though rarely, there is only one hydatid sac, which is in contact with the inner surface of the cyst, and forms a lining for it. Much more commonly, this inner sac, which may be considered as the mother hydatid, contains a progeny of smaller sacs, or young hydatids, which are of all sizes, from that of a millet-seed up to that of the fist, and are sometimes very numerous. They float in a serous liquid, usually of a yellowish colour. In some instances the cysts attain an enormous size, occupying a large portion of the liver, and containing many pints of liquid. They may remain for a long time without material change, and with little disturbance to the health. But generally, sooner or later, they become the seat of a morbid action, and undergo various changes, which sometimes probably reconduct to health through the agency of absorption, and sometimes end in products which are described as resembling variously steatomatous, atheromatous, melicerous, and tuberculous deposits. Not unfrequently they inflame and suppurate, thus forming abscesses which contain the remains of the hydatids mixed with the pus. These abscesses sometimes pursue a course similar to those resulting from ordinary hepatitis, gradually approaching the surface of the organ, and forming, through the agency of adhesive inflammation, a passage externally, or into some one of the different contiguous cavities. Instances of recovery have repeatedly occurred in such cases, though the danger of extensive inflammation and consequent exhaustion is always great. Dr. Theophilus Thompson, in his "Lectures on Pulmonary Consumption" (Am. ed., p. 33), relates a case in which hydatids of the liver were coughed up, and the patient at the period of the report was in a fair way to recovery. Sometimes they are vomited in large quantities, showing that the cyst had opened into the stomach. A case is on record in which a hydatid burst into the hepatic duct, whence its contents with the young parasites passed into the duodenum. The case terminated fatally; but had the health of the patient been otherwise good, it might have resulted in a spontaneous cure. (Barlow, *Lancet*, Feb. 1860, p. 195.)

There is no mode by which hydatids can be distinguished during life, until their fluctuation becomes evident; and then they may be readily mistaken for common abscess. Such a mistake has been occasionally made, and hydatids have been opened with fatal results. The most striking diagnostic characters are the greater resistance of hydatids to pressure, their greater elasticity, and their more definite outline. According to M. Piorry, a cyst containing numerous hydatids yields, under percussion, a peculiar quivering sensation which is quite characteristic. Skoda says that a good idea of it may be obtained by tapping a repeater held in the hand, or percussing a stomach completely filled with water, and held in the air. He states, also, that it may be observed in cases of peritoneal effusion when the abdomen is tense, and the walls not very thick, and that it must be rarely observed in hydatid cysts. Dr. Ballard compares the sensation to that imparted to the finger by percussion upon a mass of jelly. M. Moissenet, of Paris, makes the following statement. The left hand somewhat firmly applied over the most prominent part of the tumour, when percussion is made with the fingers of the right hand, is sensible of a deep movement of alternate expansion and retraction, a true oscillation or vibratory trembling, resembling that produced in a caoutchouc balloon filled with water, and similarly treated. (*Arch. Gén.*, Fév. 1859, p. 150.)

Notwithstanding the fatal consequences which have ensued from the puncture of hydatid cysts by mistake, it has been proposed to open them with a view to the discharge of their contents, and the institution of a curative process in the sac. It is asserted that this has been done successfully in several cases by M. Recamier. His plan was to apply caustic over the most prominent point of the integuments, to divide the slough, again to apply the caustic through the opening, and to repeat the process, until at length a slough opened into the cavity. It is supposed that, before the separation of the slough, the contiguous surfaces of the peritoneum will have been united by adhesive inflammation. To prevent the entrance of the air, the evacuated cavity is filled with an emollient liquid, and is kept full during the progress of the cure, which is measured by the diminution of the quantity of liquid necessary for the object. The injected fluid may be rendered slightly stimulant or antiseptic in cases attended with indolence or fetor of the cavity. A case is on record in which alcohol was injected, and the patient, after suffering for a time with vomiting, fever, and jaundice, recovered at the end of three months, the tumour having quite disappeared. (*Bull. Gén. de Thérap.*, Mai, 1855.) M. Aran has related two cases in which recovery followed the puncturing of the sac, and the injection of tincture of iodine mixed with an equal weight of distilled water, and a little iodide of potassium. (*Ibid.*, Sept. 1854.) Dr. Murchison recommends that in all instances when the hydatid can be diagnosticated, and is increasing, it should be evacuated. But this, he states, should be done by means of a fine trochar and a corresponding canula. Thus performed, the operation is both safe and effectual; the evacuation of the fluid alone being sufficient to destroy the life of the parasite. Of 20 cases thus tapped, all but three recovered; and death in these was not justly ascribable to the operation. Most of the fatal results which had followed the operation are ascribed by Dr. Murchison to the use of a large trochar, or of a scalpel, in the opening of the tumour. (*Lancet*, Nov. 1865, p. 518.)*

Malignant Affections.—The liver is peculiarly liable secondarily to all the malignant formations. It is also frequently attacked by them primarily. Thus, genuine scirrhus, medullary carcinoma, colloid cancer, fibro-plastic tumour, and melanosis are all occasionally met with in the liver as original affections. These tumours may make their attack either at a single point, and thence extend upon all sides, or at several points simultaneously. When separate tumours occur, they are apt to be upon the surface of the organ, and may thus sometimes be recognized during life. They form a number of unequal prominences, which are at first rounded, but, as they advance, become depressed towards the middle in consequence of the occurrence of softening or ulceration. While thus superficially distinct, they ultimately coalesce in the interior of the organ so as to pervade its substance. The tumours are of all sizes. The liver is generally much enlarged, and is sometimes found to weigh fifteen or twenty pounds, or even more. The proper substance of the viscus is sometimes wasted; but sometimes, on the contrary, undergoes a kind of hypertrophy; so that very variable phenomena, connected with the condition of the hepatic functions, are observed in different cases of these malignant affections. The patient is very apt to be attacked by jaundice, and by abdominal or general dropsy, which probably depend in part upon the pressure of the tumours on the biliary ducts, or on the large venous trunks, in part upon the organic changes of the liver interfering with its secretory function, and with its power of transmitting into the general circulation the blood sent to it from the abdominal viscera.

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* So long since as 1859, a paper was read by M. Moissenet, physician of the Lariboisière hospital of Paris, before the *Medical Society of the Hospitals*, in which the subject of using the *capillary trochar* for the puncture of hydatids of the liver was fully discussed, with the following conclusions.

The capillary puncture, at first used only as a means of exploration, has become curative in the hands of Recamier. This is effected by means of an instrument called the *trois-quarts capillaire* (capillary trochar). Although the operation has very often been performed without accident, yet it is not exempt from danger. A puncture made by the author in a hydatid of vast dimensions, having been followed by a speedily fatal peritonitis, led him to an examination of the causes of the accident, which resulted in the conviction that it was owing to an imperfect evacuation of the tumour. The following propositions, in addition to what has just been stated, are given, among others, by the author at the close of his communication.

1. The hydatid cyst cannot be treated like ordinary cysts by repeated punctures. The least pricking of the hydatid cyst produces a change more or less rapidly, ending in the death of the parasite, and either the cure or death of the patient.

2. The cure may take place after a single puncture, without any appreciable symptom; also after two or three punctures, but with inflammatory accidents, which require antiphlogistic treatment, or the use of other methods calculated to free the hydatid bag of purulent or septic matter, capable of poisoning the whole system.

3. With every puncture of the same cyst, changes are observed in the consistence and other sensible qualities of the liquid discharged, which, from being as at first limpid, colourless, and non-albuminous, may become successively reddish, brownish-yellow, mixed with blood or bile, turbid, albuminous, fatty, purulent, or fetid.

4. Should no such accident supervene after a half-score of punctures, there would be reason to believe that the tumour was simply a serous, and not a hydatid cyst.

5. Death from suppuration, and consequent purulent infection, may take place after a single exploratory puncture.

6. The exploring or palliative puncture may cause the escape into the peritoneal cavity of a certain quantity of the hydatid liquid, which will produce a fatal peritonitis.

7. The puncture for evacuation, by means of the capillary trochar, is less dangerous than exploration; and no case of death from the former is on record proceeding immediately from the operation itself.

8. The puncture for evacuation, with the capillary trochar, should be employed only when the cyst has an obvious tendency to advance, and when it interferes with the functions of the organs around it.

9. The evacuating puncture may be performed, whether adhesions exist or not, in cases of hydatid cyst when there is no impediment to their thorough evacuation. But when excessive weakness, and an enormous size of the tumour, necessitate an evacuation at different times, it is necessary, beyond all else, to endeavour to bring about adhesion between the cyst and the abdominal wall by the application of caustic over the tumour.

10. Cure of hydatid cysts having been produced by capillary punctures alone, we cannot appreciate the value of iodine injections practised in other cases after puncture.

11. The only legitimate inference from the cases in which frequent injections have been successfully used, through canulæ of large dimensions, is that such injections are antiseptic in these, as in other foci of infection to which they have so often been applied. (*Arch. Gén.*, Juillet, 1859, p. 59.)—*Note to the sixth edition.*

Malignant diseases of the liver usually give rise to the phenomena of chronic inflammation of that organ, and indeed are not unfrequently attended with more or less of that condition. The lancinating character of the pain sometimes serves as a diagnostic symptom; but it cannot be relied on; because this kind of pain may occur in affections which are not malignant, and the malignant affections sometimes occasion little or no pain, and the pain, when it does occur, is by no means always lancinating. The existence of one or more prominences on the liver, sensible to the touch, is another highly characteristic symptom. But the absence of such superficial tumours is no proof that the case is not malignant; and their presence, when they do exist, is sometimes concealed when the liver is covered by the ribs, or the abdomen distended by dropsical effusion or intestinal accumulations. The first positive proof, therefore, of the character of the hepatic affection is afforded by the examination of the body after death. Dr. Eiselt, of Prague, has shown that melanotic cancer of the liver is sometimes attended with black pigment-matter (*melanosin*) in the urine. (*Braithwaite's Retrosp.*, xlvi. 67.)

No particular precepts are required for the treatment of these diseases. Until the nature of the affection in each particular case is ascertained, it will be managed in the same manner as if it were one of chronic hepatitis. Afterwards, our efforts will be limited to the relief of pain by opiates or other anodynes, and to the palliation of the other symptoms.

Besides the organic derangements above referred to, the liver is subject also to others, which, nowever, are very rare, and demand no special precepts. Among them may be mentioned the production of a peculiar vascular erectile tissue, enlarged blood-vessels, worms contained in cysts, osseous deposits, and various anomalous tumours.*

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* *Adenoid or Gland-like Tumours of the Liver.*—This is a rare affection, noticed by Rokitansky, but more particularly described by Prof. Griesinger, from whose paper, published in the *Archiv der Heilkunde*, A.D. 1864, and translated in the *Archives Générales* (Octob. 1864, p. 424), the following account is condensed. There are formed in the substance of the liver encysted circumscribed tumours, consisting of hepatic tissue, disposed in a special manner, different from the normal. Most frequently there is but one tumour; but sometimes they are multiplied, and the number may amount to hundreds and even thousands, crowding the liver in its whole extent, and considerably augmenting its volume, while the proper parenchyma of the organ is atrophied. The elements of these structures are liable to degeneration, especially to the fatty; and sometimes the whole mass is liquefied. The larger tumours sometimes form protuberances on the surface of the liver, which is at once enlarged and rendered very irregular. The patient for a long time experiences little or no pain or disturbance of the general health; but at length, after the organ has been enormously enlarged, the usual consequences of hepatic obstruction result, and he now suffers from dropsy and marasmus. The main cause, probably, of the slight impression at first on the constitution is that the tissue of the tumour has the property of secreting bile so long as it remains itself undestroyed. The disease is capable in the end of causing death, independently of any complication. From cancer it is distinguished by its much slower march, and the later period at which it begins to react on the general health. From hydatids it can be distinguished only when, in consequence

Article III.

FUNCTIONAL DISEASES OF THE LIVER.

UNDER this head I propose to treat of the disorders of the liver unattended with inflammation or other organic derangement. They are all perversions either of the nervous, circulatory, or secretory processes.

1. *Nervous Disorder.*

Neuralgia.—The only known affection of the liver coming exclusively under this head is neuralgia. Pains are not unfrequently felt in the right hypochondrium and the epigastrium, wholly unconnected with any appreciable change in the healthy structure of the organ. They are sometimes obtuse, sometimes acute and lancinating; and vary exceedingly in their duration and periods of recurrence. They may be ephemeral, irregularly remittent, intermittent, or continuous, and may vanish in an instant, or endure for variable periods, even for months or years. I have before mentioned the case of an elderly lady, who was affected with pains of this kind almost constantly during a great part of her life. They are probably connected in general with a gouty or rheumatic diathesis, or at least have appeared to be so in cases which have come under my notice. They may be distinguished from the pains of inflammation by the absence of all the other signs of that affection, especially of the tenderness upon pressure. Instead of being increased, they are often relieved by compression of the organ. There is usually no loss of appetite, no disorder of bowels, unless, perhaps, occasional constipation, no jaundice, and no febrile disturbance. The treatment is the same as that of neuralgia elsewhere. (See *Neuralgia.*) Combinations of colchicum with opiates or other narcotics, and, in the intermittent form, sulphate of quinia in the intervals, will probably be found the most efficient remedies.

2. *Circulatory Disorder.*

Congestion.—*Hyperæmia.*—This consists in a preternatural fulness of the blood-vessels of the liver, and a consequent general or partial distension of the organ.

It may be attended with a sense of fulness, tension, weight, or oppression in the region of the liver, diminution or loss of appetite and a furred tongue, constipation or looseness of bowels, deficiency or excess of biliary secretion, and a bilious tinge of the eyes, skin, and urine. None of these symptoms, however, are constant. There is very commonly a feeling of general uneasiness, languor, dulness, drowsiness, or depression of spirits; the patient being conscious of something wrong in himself, and disposed to see nothing right in things about him, and yet wholly unable to explain the cause of his sensations. Sometimes there is a disposition to make frequent deep inspirations, as if to relieve the congestion by the pressure of the diaphragm. The pulse is not unfrequently irregular. The symptoms vary somewhat according as the congestion is active or passive, the former being frequently attended with a degree of general vascular excitement, the latter wholly without it, and sometimes even marked by a languid circulation. If the hypochondrium be carefully examined, especially with percussion, the liver will often be found to extend beyond its normal

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of puncture of the latter, the presence of echinococci can be demonstrated. When examined during life, the tumours, notwithstanding their really soft consistence, may convey to the hand the feeling of great hardness. For an account of their precise microscopic characters, the reader is referred to the essay in the *Archives Générales* above noticed. (*Note to the sixth edition.*)

limits. In some instances, the symptoms come on quickly and as quickly disappear; in others, they are more lasting, and if not relieved end in serious disease. In the efforts of nature to unload and relieve the liver, either directly by increased secretion or hemorrhagic depletion from the organ, or indirectly by depletion from the blood-vessels of the alimentary canal, she not unfrequently carries her salutary operations to the point of disease, and induces an attack of cholera morbus, diarrhœa, melæna, or hemorrhage from the bowels or rectum. Should her efforts be unsuccessful, gastric or intestinal inflammation, colic, or hepatitis may ensue from the congested state of the portal circulation. Another disadvantage from portal congestion is deficient absorption of the contents of the alimentary canal. Nutrition is, therefore, interfered with; and medicines swallowed act more slowly on the system, and sometimes are prevented from acting until the interfering cause is removed.

When the liver of a person who has died of some other complaint during congestion of that viscus is examined, it is found to be enlarged either wholly or partially, to bleed when cut into, and to present throughout the seat of congestion either a uniform deep-red colour, or a mottled appearance of red and yellow or yellowish-white. This mottled aspect is ascribed, by those who believe in two distinct constituents of the liver, to the injection of one of these constituents, while the other remains in its natural state; but, by those who do not admit this constitution, to the circumstance that the congestion is confined to one of the two sets of vessels, the hepatic and portal, which convey blood to the viscus. Sometimes the liver is observed to be softened, and sometimes blood to be effused into its parenchyma.

Causes.—Whatever excites irritation in the liver may occasion active congestion, the causes of which are essentially the same as those which produce inflammation. (See *Hepatitis.*) In its more passive forms, the congestion may arise either from obstruction or deficient activity in the capillaries of the liver, which prevents them from passing as rapidly as usual the blood brought to them by the portal vein, or from some impediment to the return of blood to the heart, as in cases of obstruction in the hepatic vein or ascending cava, tumours pressing upon the latter vessels, or organic diseases of the heart and lungs, which oppose the entrance of the blood into the right auricle and ventricle. An increased circulation in the stomach and bowels, without a corresponding increase of the circulation through the liver, must lead to the same result. The affection under consideration occurs most frequently in summer and autumn, and is not an unusual precursor of the more serious diseases of the season, as cholera morbus, diarrhœa, dysentery, and the autumnal fevers.

Treatment.—When the complaint is accompanied with arterial activity and general plethora, it may be proper to take blood moderately from the arm; but this is not often requisite. An emetic will sometimes operate very effectually and speedily in removing the congestion, partly by producing compression of the liver, partly by stimulating the secretory function. Generally, however, all that is required is a pretty brisk purge, containing a proportion of calomel or the blue mass. The compound cathartic pill of the U. S. Pharmacopœia is a very suitable combination. If deemed preferable, the mercurial may be given first, and followed in a few hours by some quicker cathartic, as sulphate of magnesia, infusion of senna with salts, or castor oil. By this method, depletion is effected directly from the vessels both of the bowels and the liver. The patient may continue to feel uncomfortable until the day after the operation of the medicine, when he generally experiences complete relief. If the congestion, or a disposition to it should continue, a blue pill, alternated with a mild laxative every day, or every other day, will soon effect a cure. It is necessary, however, that the diet should be attended to; and, if the patient is plethoric, and the pulse strong or excited, to restrict him for a few days to vegetable food, or to this combined with milk. The foregoing plan of treatment will answer whether the congestion arise from irritation or torpor of the liver; though in the latter case bleeding can scarcely be requisite, and animal food, as a general rule, need not be prohibited. Should the cause of the affection be mechanical, the practitioner will be guided by the nature of the impediment, which he will endeavour to remove or to palliate; and, when this is impossible, temporary relief may still be obtained by the occasional use of mild purgatives with mercurials.

3. *Secretory Disorder.*

The secretion of the liver may be excessive, deficient, or depraved. In either case, the affection generally ends in complaints which are treated of distinctly; as diarrhœa, cholera, jaundice, constipation, and melæna, to which severally the reader is referred. There is, however, a stage of the hepatic derangement, before either of the above-mentioned complaints is decidedly produced, which deserves attention, as, if it be opposed by proper treatment, the more serious consequences may generally be averted. This is indicated by the state of the alvine evacuations, which, in the absence of the symptoms of hepatic congestion, yield the only certain evidence of the derangement.

Excessive secretion may be inferred from the deep bilious colour of the stools, often connected with abdominal pains or uneasiness, and sometimes with loss of appetite, nausea, and slight vomiting of bile. If not arrested, or if violent from the onset, it occasions bilious diarrhœa or cholera morbus. It may arise from any cause capable of stimulating the liver, as heat, miasmata, gastric or intestinal irritation, congestion of the portal circle, &c. The liver appears, in hot climates, to act vicariously for the lungs in carrying off from the blood the excess of carbonaceous matter. It is a well established fact, that less carbonic acid is produced by respiration at elevated than at low temperatures; and, consequently, if the same diet be employed, an excess of carbon must ensue, unless carried off by some other emunctory; and none is known capable of performing this office so efficaciously as the liver. This organ, therefore, secretes more profusely; the direct stimulus under which it acts being probably that of the carbonaceous principles accumulated in the blood. It is not improbable that the hepatic secretory function is thus frequently excited to excess.

The treatment, in this early stage, should consist chiefly in the removal, as far as possible, of the cause, and in assisting nature to throw off the effete matter which is offending her. The means are a mild diet, cool and unstimulating drinks, bodily repose, the avoidance, as far as practicable, of exposure to heat, and the use of mild cathartics, such as castor oil, the Seidlitz powder, or a small dose of sulphate of magnesia, to remove the bilious matter from the bowels. Should these measures fail, a small dose of some mild mercurial, such as the blue mass or calomel, followed by a laxative, will prove useful by unloading the liver.

Deficient Secretion.—The liver may either secrete less than usual, or cease for a time to secrete altogether. In the former case, the stools will often be scanty or light-coloured, or both. At first they often assume a light-yellow colour, as in infants, and, if the affection continue, gradually become lighter and lighter, until at length they no longer exhibit the appearance of bile, and are either clay-coloured or whitish. I have also noticed that the obvious deficiency of bile, as indicated by the whitish discharges, is occasionally preceded immediately by black or blackish stools. This deficiency of bile may be attended with constipation; or, in consequence of portal congestion arising from the suppression of the biliary secretion, diarrhœa or dysentery may ensue, the stools being in the former case copious and whitish or nearly colourless, in the latter small, mucous, and without bile. When the stools are thus destitute of bile, it may generally be inferred that the hepatic secretion has been diminished greatly, or suspended, unless indeed the symptoms of obstruction of the biliary passages are presented. Along with the condition of the evacuations alluded to, there is usually more or less intestinal uneasiness, gastric derangement, and mental depression; although these are by no means essential concomitants. Diarrhœa and dysentery have been mentioned as consequences of this kind of hepatic disorder. Jaundice is also among its frequent results. The recent observations in relation to the part which the liver plays in modifying the condition of the blood, explain the well-known influence of deranged function in that organ, causing mental depression and various nervous disorders. I have often noticed that the alvine evacuations accompanying defective secretion of the liver are very offensive to the smell, with an odour quite different from the fecal, while fetid gases are also apt to be extricated and discharged. These phenomena may be ascribed to a kind of putrefactive fermentation in the contents of the bowels, owing to the absence of the antiseptic influence of the bile.

The causes of this inactivity of the liver are not always obvious. It may result from an excessive stimulation, followed as this condition often is by a proportionate torpor. It may depend also upon a diminished quantity of the materials for bile in the blood. But it probably more frequently proceeds either from the embarrassment which an overloaded condition of the organ may occasion in the due performance of its function, or from some direct or indirect sedative agency, as mental anxiety, bodily inactivity, sympathy with an enfeebled stomach, the diversion of nervous energy elsewhere, the revulsive influence of other affections, and general impoverishment of the blood.

The principles of treatment are simple. The remedies must be such as are calculated to stimulate the secretory function of the liver, care being taken also to remove the causes, as far as this can be done. Alterative doses of mercury, combined with chalybeates or the bitter tonics when the stomach is enfeebled, and with mild cathartics, as rhubarb and aloes in small doses, when constipation exists, are by far the most effectual. Sometimes it may be proper to commence the treatment with a purgative dose of calomel or the blue pill, accompanied or followed by a laxative; but generally it will be sufficient to give, every evening or every other evening, a grain of calomel or a blue pill, to be followed by a laxative in the morning; and this treatment is to be continued until the discharges assume a decided bilious character. Caution should be observed never to allow the mouth to become sore. Nitromuriatic acid may be resorted to if mercury fail, or cannot be given. Should diarrhœa, dysentery, or jaundice ensue, they must be treated as elsewhere directed. Should intestinal irritation result from the bile secreted under the mercurial influence, it may be arrested by from five to ten drops of laudanum, or a fluidrachm of paregoric. Aloes and dandelion have some reputation also as cholagogues, and may be employed as adjuvants of the other more efficient remedies.

Vitiated Secretion.—The bile is often much vitiated. Sometimes it becomes very acrid, producing violent gastric and intestinal pains, and even spasms. Such is the case frequently in bilious diarrhœa and cholera morbus, when the secretion has undergone no obvious change of colour. But not unfrequently it is also much altered in appearance. Thus, it may be green, dark brown, or blackish. The greenness of the bile sometimes discharged from the stomach and bowels is often owing to acids in the alimentary canal; but there is reason to believe that the bile is occasionally green when secreted. There can be little doubt that black bile is often discharged from the bowels. I have repeatedly noticed it of a deep-brown almost black colour after large doses of calomel. Some consider the black tarry stools of melæna as resulting exclusively from intestinal or gastric hemorrhage. I have no doubt that they are also the consequence of hemorrhage or perverted secretion of the liver; as the same material has been found after death in the biliary ducts and gall-bladder. Bile may, moreover, be vitiated by the loss of one or more of its characteristic ingredients. It is asserted to have been produced of a white colour, and albuminous.

The causes of this perverted action of the liver cannot always be traced. Generally they are not distinguishable from those which occasion a mere increase or diminution of its function. Sometimes the affection may be ascribed to a vitiated state of the blood, as in scurvy and low fevers.

The treatment is essentially the same as that required by deficient secretion. When the affection assumes the form of melæna, it must be managed as directed under that disease.

The importance of attending to these functional disorders of the liver, in their earlier stages, cannot be too strongly impressed on the young practitioner. At this period, they may generally be arrested with the utmost facility, and thus prevented from running on into diseases which are not only troublesome and painful, but also frequently dangerous, and sometimes fatal notwithstanding the most energetic treatment. Whenever there is any reason whatever to suspect deranged hepatic function, the alvine evacuations should be inspected, and, if not healthy, should be corrected.*

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* *Functions of the Liver.*—Since the foregoing pages were written, considerable advance has been made in the study of the functions of the liver; and, though nothing said in the text has, I think, been disturbed, and the observations made are as yet interesting more in a physiological point of view, than either pathologically or therapeutically, yet a brief sketch of the more prominent points may be introduced here, as the practitioner may find advantage from recurring to them for the explanation of otherwise obscure phenomena, or as suggestive of some useful modification of treatment.

The liver performs at least three offices; 1. in separating effete and injurious substances from the blood; 2. in the production of an agent which acts an important part in the function of digestion in the bowels; and 3. in changing the blood brought to it through the portal vein, so as to fit it better for the fulfilment of its purposes in the animal economy. The first two functions it exercises in the secretion or production of the bile. For forty years I have taught that the bilious colouring matter is formed in the blood, resulting probably from the disintegration of the red corpuscles, which, like all other living structures, are undergoing constant decay and regeneration. The colouring matters, resulting from the destruction of the hæmatin of the blood, are probably partly consumed in the normal production of black pigment and other colouring material existing in the solid tissues; but are prevented from an injurious accumulation in the blood, by elimination as excrementitious matter, partly by the kidneys, but chiefly by the liver, forming the colouring substances of the bile. Of these, as appears from the researches of Dr. Thos. Antisell, who submitted the bile contained in the gall-bladder to dialysis, and examined the constituents thus separated by means of a microscope, there are two quite distinct; one yellow, and forming round corpuscles, appearing as if organized; the other brown, and in amorphous granules, which, submitted to the action of nitric acid, exhibited first tints of blue, red, and brown, and ultimately amber-yellow, and in which, while undergoing decomposition, he detected crystals of hæmatoidin, proving its origin from the red corpuscles. (*Am. Journ. of Med. Sci.*, Jan. 1864.) The last is the important point in his observations; coinciding with the opinion of Virchow that *cholepyrrhin*, the colouring matter of bile, is allied to *hæmatoidin* or blood crystals (*Cell. Pathol.*, Am. ed., pp. 176–7); and with the fact, subsequently established by Max Jaffe, of Berlin, that hæmatoidin and *bilifulvin*, one of the two principles into which, according to Berzelius, cholepyrrhin may be resolved, are absolutely identical; thus proving that the colouring matter of bile is separated from the blood, as I have long maintained, and not created by the liver.

Besides colouring matter, the cholesterin of the bile is also derived from the blood, in which it exists, either as a regular constituent, or an excrementitious matter resulting from the nutritive changes in the nervous tissue, which always contains it, and possibly upon its own disintegration, surrenders it to the blood. From an elaborate investigation into the functions of the liver by Dr. Austin Flint, jun., of New York, it appears that cholesterin derived from the blood is an ordinary constituent of the bile, with which it passes into the duodenum, where it is changed into a principle of analogous character called *serolin*, so named from having been detected in the serum of the blood, but for

Article IV.

DISEASES OF THE BILIARY PASSAGES AND GALL-BLADDER.

1. *Inflammation of the Ducts and Gall-bladder.*

THE biliary ducts, like all other similar passages, are liable to inflammation of their mucous membrane, which becomes swollen so as in some measure to impede the flow of bile. The deficiency of this fluid in the stools, and the consequent bilious tinge of the skin and urine, are the only symptoms by

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which *stercorin* is proposed as a substitute by Dr. Flint, as it is one of the characteristic ingredients of feces, in which cholesterin is never found in a perfectly healthy state of digestion. (*Ibid.*, Octob. 1862, p. 305.) Dr. J. K. Salisbury has since detected cholesterin in the seminal fluid and the ovaries; in the saliva, tears, and perspiration; in the urine of intermittent, remittent, and typhoid fevers, of diphtheria, and diabetes, but not in that secretion in health; in human milk; in the liquid from inflamed mucous surfaces, and that of ascites; in butter, and the fat of beeves and hogs. (*Ibid.*, April, 1863, p. 289.) In all these products it is probably derived from the blood. Considering, therefore, the great number of outlets, it seems to me hardly probable, as supposed by Dr. Flint, that, when the biliary secretion is defective or suppressed, cholesterin should accumulate so largely in the blood, as to be the main source of the fatal results sometimes proceeding from suppression of the bile.

Cholesterin is known by the form of its crystals, as seen under the microscope. These are rectangular or rhomboidal plates, very thin and transparent, with parallel borders, breaking in parallel lines, and consisting of a succession of superimposed layers, of the lower of which the edges may be seen through the upper. (*Flint.*) Strong sulphuric acid produces both with cholesterin and serolin a peculiar red colour. Hugo Schrift proposes, as a test for cholesterin, a mixture of strong sulphuric and muriatic acids with solution of perchloride of iron, which, upon contact with crystals of that substance, produces a magnificent purple. (*Journ. de Pharm.*, Juillet, 1863, p. 326.)

The second office of the liver is to prepare materials from the blood calculated to aid digestion, such as the glycocholate and probably the taurocholate of soda, which, with the colouring principles, the cholesterin and other fatty matters, and various salts, constitute the bile. That this secretion is essential to healthy digestion is proved by the disordered state of that function when deprived of its aid, either by obstruction of the ducts or suppression of the secretory act. How it acts is not, perhaps, thoroughly understood; but it is said to aid the pancreatic juice in emulsionizing fats, and changing starch to glucose, while it no doubt tends to check putrefaction in the abdominal contents, as the feculent discharges are apt to be offensive in its absence.

The third function of the liver, though probably not less important than the others, is still more imperfectly understood. It has long been supposed that the gland is one of the organs which contribute to the elaboration of the blood; and various modes have been suggested in which it might act to this end, but hitherto the support of positive proof has been wanting. There is, however, reason to believe that the field of exploration has been fairly opened, and at least one important step taken. It is now well known that Bernard detected the existence of glucose or grape-sugar in the liver; and for a time it was supposed that the production of this substance might be one of its normal functions. The same physiologist afterwards determined that glucose was not the immediate result of hepatic action, but was generated from a starch-like principle through the agency of albuminous matter acting as a ferment; and it was this amyloid substance, to which he gave the name of *glycogene*, that was really generated in the liver out of the portal blood. Dr. Pavy, however, has shown by experiment that, during life, and in a healthy state of the organ, the production of glucose does not take place; and, consequently, when it is produced largely, the organ is diseased, and may thus become the real source of diabetes. The experiments of Dr. Pavy were confirmed by Dr. Robert McDonnell, of Dublin, who maintains that the amyloid substance generated in the liver is the first step in the conversion of the ternary hydrocarbons (substances like starch, sugar, gum, &c., composed of carbon, hydrogen, and oxygen) into the nitrogenous bodies necessary for the constitution of the system; its conversion into glucose being a deviation from the normal course. (*Lancet*, April, 1865, p. 341.)

Henle agrees with Dr. Hanfield Jones in the conviction that the bile is produced in the biliary ducts, from the blood of the hepatic artery, as it ceases to flow when that artery is cut; while it is the parenchyma of the lobules in which the glycogenic function of the organ is exercised on the portal blood. (*Ed. Med. Journ.*, May, 1868, p. 887.)—*Note to the sixth edition.*

which the affection can be recognized; as pain is generally very slight or quite wanting, and the inflammation is not sufficiently extensive to call into play those sympathies which act so important a part in hepatitis. Nor can these symptoms be depended on, arising as they do from many other pathological conditions, and from some much more frequently than from the one in question. The inflammation may occupy a portion or the whole of the ducts, and may even extend to the tubuli biliferi, and thus produce symptoms of obscure hepatitis. Sometimes it ends in softening and ulceration of the membrane; and even perforation of the coats has been known to occur, followed by the escape of bile into the peritoneal cavity, and fatal peritonitis. Such a result, however, is exceedingly rare, unless as a consequence of obstruction of the duct, or obliteration of its cavity at some point. Occasionally the ulcers heal, and, by their contraction, produce stricture or obliteration of the passage. The same consequence may flow from a permanent thickening and induration of the coats from chronic inflammation.

The gall-bladder is not unfrequently inflamed. Either the peritoneal covering, or the mucous coat may be affected. In the former case, adhesions are apt to be formed with the contiguous surface of the liver, or with the peritoneal investment of neighbouring viscera. The affection, when exclusive, might be indicated by acute pain, confined to one spot, beneath the edge of the false ribs, and behind the right rectus muscle; but the diagnosis must always be uncertain. Still more obscure are the symptoms of inflammation of the mucous membrane. It probably generally ends in resolution without any observable sign, unless perhaps a dull pain or sense of uneasiness in the part. Sometimes, however, the membrane ulcerates, and the bladder may become filled and distended with pus, though this can happen only when the outlet is closed. Cases have occurred, in which the distended bladder has been perforated, and its contents have escaped with fatal effect into the abdominal cavity. The affection has sometimes pursued a safer course, exciting adhesive inflammation in advance of the ulceration, and thus enabling the purulent and bilious matters to escape at the surface, or into some one of the hollow viscera, communicating externally.

The coats both of the biliary passages and gall-bladder are also liable to an interstitial deposit of lymph or pus, and to various alterations of structure, which more or less tend to interfere with the course of the bile. Among these changes is a sort of fatty degeneration, analogous to that which often affects the great blood-vessels, and occurring especially in advanced life. By the stiffening of the coats thus produced, the bladder is prevented from duly contracting; bile is consequently retained; and formation of gall-stones, and inflammation of the inner surface may ensue. (*Dr. George Budd.*) The capsule of Glisson appears sometimes to be thickened, and thus made to press upon the contained vessels and ducts; and Mr. Twining refers to two small bodies, which he considers as absorbent glands, one seated near the junction of the gall-bladder and the cystic duct, the other in the upper portion of the common duct, and which sometimes become so much enlarged by inflammation as to obliterate the passage.

The causes of these affections, so far as they are peculiar, are probably the propagation of inflammation from the duodenum or liver, and the presence of acrid bile, and of biliary concretions.

The treatment in those cases in which a probable diagnosis can be made out, must be conducted upon the same principles as that of inflammation of the liver, though the means requisite will be much less energetic It is only in inflammation of the gall-bladder, that opportunity for treatment in the earlier stages will in general be presented. In the other cases the interference of the practitioner is seldom required, unless to correct the effects, such as jaundice and bilious accumulation.

2. *Biliary Calculi*, or *Gall-stones.*

This name is given to concretions which form in the gall-bladder, and the hepatic and biliary ducts. They differ in number, size, and position. There may be only one, or there may be thousands. They may be of the minutest size, or large enough to fill the whole cavity of the gall-bladder. They are found in the gall-bladder, tubuli biliferi, and biliary ducts, and occasionally also in the bowels. Concretions of very great size have been observed in the last-mentioned position; and it has been made a question, whether they originated in the intestines, or were carried into them through the biliary passages. I have seen them so large as to fill the caliber of the bowel, and moulded exactly to its shape. In one case of this kind, they produced all the symptoms of obstruction of the bowels, which were relieved upon their expulsion. They were clearly too large to have passed through the ductus communis, and may have either entered the bowels while yet small, and have grown by accretion, or may have been formed in the latter position. Sometimes, when they cannot pass the ducts, they produce inflammation and ulceration, and thus make their way into the bowels; but no satisfactory reason can be given, why bile which has entered the alimentary canal, may not deposit solid matter and thus increase or form concretions. Sometimes several calculi become impacted into a mass in the bowels, and produce ileus by obstructing the passage.

Gall-stones are usually of a yellowish, brownish, or brownish-yellow colour, of a rather soft consistence, and of various shapes, but generally with several irregular faces, and rounded angles, produced by their mutual pressure and attrition. Their composition is various; but they consist most frequently of cholesterin and bilious colouring matter. The peculiar acids of bile and one or more of the fatty acids, are sometimes the prominent ingredients; and calculi, consisting chiefly of phosphate and carbonate of lime, have been found in the gall-bladder or biliary passages.

The concretions are probably formed in general by deposition from the bile around a solid nucleus, which may be insoluble matter precipitated from the bile, coagulated blood, fibrinous exudation, or solidified mucus. Whatever impedes the flow of the bile favours their production. The character of the secretion no doubt also has considerable influence; a thick, viscid bile, in which the liquid solvent is saturated with the solid constituents, being more likely to form calculi, than the same liquid in its ordinary state. It is possible that a deficiency of alkali in the bile may have the same effect. According to Dr. Powell, gall-stones are comparatively rare in hot countries. Is this ascribable to a more liquid consistence of the bile?

The calculi often remain in the gall-bladder long without causing inconvenience, and are first discovered upon examination after death. They may even lie in the ducts without producing any considerable uneasiness. It is when in the course of expulsion, or when so large as to occasion distension or obstruction, that they become sources of trouble. If accumulated in the gall-bladder, they may sometimes be detected by a dull crepitation, produced when pressure is made so as to cause them to move on one another; and in certain rare cases they are large enough to be felt upon external examination near the pyloric region.

One of their ordinary effects is severe pain. Putting the coats of the tube upon the stretch, they probably cause it to contract spasmodically, especially at or near the orifice by which the common duct enters the duodenum. The pain is sometimes exceedingly violent. It usually comes on suddenly in the epigastrium or toward the right side, being felt especially at a point corresponding with the orifice of the common duct, and thence shooting to the back. It occurs in paroxysms, though there is commonly a persistent dull pain in the intervals. It is often attended with a pale skin, a slow, small, and feeble pulse, nausea and vomiting, anxiety and restlessness, hurried respiration, faintness, and great prostration. The paroxysms may occur several times an hour, and the attack usually continues from a few hours to two or three days, though the case is sometimes much longer protracted. The calculus at length generally escapes into the bowels, and passes along with the stools, in which it may be discovered upon inspection. Relief is experienced the instant that it enters the duodenum. When in the hepatic duct, though it may not be attended with the ordinary colicky symptoms, it provokes a local irritation, which may give rise to phenomena closely resembling intermittent fever, and sometimes continuing long, with irregularly recurring rigors. (*Frerichs.*)

Another morbid effect of gall-stones is inflammation. This may arise from the irritation of their presence, from their direct pressure or distending force, or from the bilious accumulations which they occasion. The inflammation sometimes ends in suppuration, ulceration, and, through the medium of adhesions between the contiguous peritoneal surfaces, the discharge of the calculus externally, or into one of the open cavities. Recovery sometimes takes place under these circumstances.

A third effect worthy of notice is obstruction. A duct may be distended by one of these concretions so as to produce spasm, inflammation, and ulceration, without a complete stoppage of the flow of bile, which may find its way alongside of the calculus. But, even in this case, there may be undue accumulation of bile behind the impediment; and, when the obstruction is complete, as occasionally happens, the accumulation is sometimes enormous; its precise seat depending upon the position of the stone. If this be in the hepatic duct, the distension will be in the tubuli biliferi, and the liver may become so much enlarged, and so full of fluid as to yield a sense of fluctuation upon being examined externally. If the cystic duct be obstructed, the gall-bladder only will be distended; if the common duct, both the gall-bladder, and all the biliary ducts behind the point of obstruction. The absence of bile in the alimentary canal, the consequent derangement of digestion, and general jaundice, are other results of this affection; and, if the obstruction should not be removed in due time, ulceration and perforation must ultimately ensue, with the escape of the bile into the cavity of the peritoneum, or externally, or into some portion of the alimentary canal; death being a necessary consequence in the first case, and a probable one in either of the others.

In the treatment of biliary calculi, the first indication is to obviate their effects, the second to cause their expulsion or solution, and to prevent their formation. The effect which most urgently calls for interference is the spasmodic pain. For the relief of this, opiates in large doses were, until recently, incomparably superior to all other means employed. One, two, or three grains of opium, or an equivalent quantity of one of its liquid preparations, may be administered every hour or two, and sometimes even at shorter intervals, either until the patient experiences some relief, or narcotic symptoms are produced. Should the stomach reject the opiate, it may be administered by the rectum. The same end may be gained more quickly by the inhalation of ether or chloroform; and these may very properly be employed as substitutes for or adjuvants of opium. If the patient is of a plethoric habit, and especially if the case is complicated with inflammation, blood may be taken from the arm; but venesection is often contraindicated by the existing debility. The warm bath and warm fomentations to the seat of pain are excellent adjuvants. Ice has been applied to the epigastrium, and is said sometimes to have afforded speedy relief. The tobacco enema has been recommended, but should be used, if at all, with great caution, and only in cases in which the general strength is unimpaired. Emetics are also a doubtful remedy. They may sometimes remove the obstruction by forcing forward the calculus, and relieve the spasm by the relaxation attendant upon the nausea they produce; but nature usually provides in a sufficient degree these means of relief; and the superadded action of an emetic might endanger rupture of the distended gall-bladder or ducts. In cases of alarming faintness and prostration, recourse may be had to the aromatic spirit of ammonia and the ethereal preparations internally, and a mustard cataplasm to the epigastrium. Any inflammation that may ensue must be counteracted by the usual remedies.

The second indication is best met by the free use of alkaline medicines, and the employment of a regulated diet, from which fats and an excess of animal food should be excluded. By the first measure there may be some hope of dissolving the calculous matter, or at least of preventing its deposition by increasing the solvent power of the bile; by the second, of preventing the production of an excess of material out of which the concretions are most commonly formed. There would seem also to be an indication for the use of remedies calculated to increase the amount of biliary secretion, which may thus have a greater solvent power. Hence, mercurials may be conjoined, in alterative doses, with the alkalies. Another remedy proposed by M. Durande, of Dijon, which had at one time considerable repute in Europe, was a mixture of two parts of sulphuric ether and three of oil of turpentine, given in the dose of thirty minims or a fluidrachm. This was supposed to have the power of dissolving the calculus. Any benefit which it may have produced is probably more justly ascribable to its antispasmodic action.

8. *Distension of the Gall-bladder.*

This may result from various causes. The most frequent are such as produce obstruction in the common duct, as gall-stones, inflammation acute or chronic with its results, and tumours of various kinds. In this case, bile is the distending fluid; and the accumulation has sometimes been enormous, amounting to twelve pounds or even more. Obstruction of the cystic duct is followed by distension only in cases in which inflammation of the mucous membrane of the gall-bladder has been excited by calculi or other cause, producing a copious secretion of purulent fluid. Paralysis of the bladder is another cause of its distension.

In all these cases, the chief danger arises from the rupture or perforation of the coats, and the escape of the bile or pus into the abdominal cavity; though, as before mentioned, the liquid may sometimes find a safer outlet by an ulcerated opening into the bowels, or through the skin. In many cases, the obstruction is removed, and the distension disappears without ultimate injury. It is very necessary, therefore, not to confound such distension of the gall-bladder with abscess of the liver; for, by opening the former, through mistake for the latter, fatal effects may be produced in cases in which nature or remedial measures might effect a cure.

The distension occasions a fluctuating tumour observable externally; but this tumour has usually a fixed situation beneath the false ribs and behind the right rectus muscle, has come on, probably, without preliminary symptoms of inflammation, and presents in all parts of its surface an equable fluctuation, obvious from the commencement, with a definite boundary, and without surrounding œdema or hardness; while, in abscesses, the position is variable, their first appearance is usually preceded by characteristic symptoms, and the fluctuation comes on gradually, is most observable in the centre of the tumour, and, for the most part, either passes insensibly into the softness of œdema, or is bounded by the hardness of exuded and coagulated fibrin.

From hydatid cysts, the distended gall-bladder may be distinguished by the want of the peculiar thrill on percussion characteristic of the former, by its usually more rapid course, and by a more obvious sympathy of the constitution.

The remedies applicable to the relief of the distended gall-bladder are not numerous. Gentle and equable pressure may be tried, especially when the distension depends upon paralysis. An emetic might prove useful; but is somewhat hazardous. Appropriate measures must be employed for the removal of any existing obstruction when this is remediable; as in the case of inflammation or spasm of the ducts. It has been made a question, how far an operation for opening the gall-bladder is justifiable. When the distended bladder has been opened by mistake for an abscess, the result has been generally fatal. Cases, however, are on record, in which the operation has resulted successfully. According to M. Petit, it may be tried when the symptoms are threatening, and when immovability of the tumour, and redness of the skin over it evince that adhesion has taken place between the peritoneal coat of the bladder and that of the parietes of the abdomen.

Article V.

JAUNDICE.

Syn.—*Icterus.*—*Morbus regius.*—*Morbus arquatus.*—*Aurigo.*

THIS is an affection in which the skin, eyes, and urine are of a yellow or yellowish colour, from the presence of bilious matter. The existence of whitish or clay-coloured stools usually enters into the definition; but is here excluded, as not always present, and not essential.

In certain conditions of the system, the skin becomes of a yellowish hue, independently of the bile or of bilious matter, as, for example, after bruises, and in cases of cancer, especially cancer of the womb; and the same result occasionally takes place, where it has been doubted whether the bile has any part, as in malignant fevers, and the bites of poisonous serpents. These cases are excluded from the definition.

The colour in jaundice is in all cases a mere symptom. The essential pathological condition is probably an excess in the blood of bile, or of its yellow colouring principle, which, not finding a sufficient outlet through the liver, is thrown off by other emunctories. It is not maintained that bile ready-formed exists in the circulation. Like urine, sweat, and saliva, it is a complex fluid, resulting from the combination of various proximate principles, some of which certainly pre-exist in the blood, some are probably created in the secretory process out of elements furnished by that fluid. It is nearly certain that the colouring matter of bile is among the former principles. Whence it is derived is a physiological question, which might be left unanswered in a practical treatise. But I may say briefly that it is probably one of the results of the disintegration of the tissues in the ordinary process of nutrition, and much more copiously of the disintegration of the red corpuscles themselves. The corpuscles, as organized bodies, must undergo constant destruction and renewal; and it seems to me in the highest degree probable that, in the change, their hematosin is converted partly at least into the bilious colouring matter. Being noxious if allowed to accumulate in the circulation beyond a certain amount, it is thrown off by the liver among the other constituents of the bile, as urea is thrown off by the kidneys. It was detected in the blood by Lassaigne (*Dict. de Méd.*, xvi. 207), and is probably the principle which very frequently gives a yellowish tinge to the serum in health. Of the excess of this yellow matter in the blood, constituting the true pathological condition in jaundice, there may be three sources, viz., excess of production, absorption, and deficiency of elimination.

1. *Excess of production.*—This probably happens in some instances of bilious fever, cholera, and diarrhœa, in which, along with a yellow colour of the skin, eyes, and even urine, there is bilious vomiting or purging. The same cause that produces the disease, may occasion an increased production of the yellow principle, which, though escaping by the usual emunctory, is not thrown off with a rapidity corresponding to the exigencies of the system, and therefore finds other outlets. The same excess may occur as an original affection; and then we shall have an attack of idiopathic jaundice with bilious stools.

2. *Absorption.*—This is believed by most to be an ordinary, and, by many, the exclusive source of jaundice. An obstruction occurs in some portion of the biliary passages, which prevents the excretion of the bile. An accumulation of this fluid necessarily takes place in the gall-bladder or biliary passages behind the seat of obstruction; and even the tubuli biliferi of the liver sometimes become greatly distended. It has been supposed that the bile is now either absorbed and conveyed into the circulation, or regurgitates directly into the venous radicles by which it was thrown out, and thus becomes excessive in the blood. Such obstructions do undoubtedly sometimes exist in jaundice, and serve as the cause of it. But whether the bile re-enters the circulation, after having been once thrown out, is not so certain. The late Dr. Chapman, of the University of Pennsylvania, denied that this event took place, and I am disposed to believe that it is comparatively rare, and of small account. Do we find a common tendency in surfaces to absorb the peculiar liquid they secrete, or which passes them in its exit from the system? Is mucus absorbed when it accumulates in the mucous cavities? Is urine absorbed in cases of distended bladder? If pus is occasionally taken up in small quantities, is not the contrary more frequently the case in abscesses? Besides, if absorption takes place so rapidly as is implied by the theory that it occasions the symptoms of jaundice, how does it happen that the accumulations of bile are sometimes so enormous in cases of obstruction? Instances have occurred, in which great distension of the gall-bladder with whiteness of the stools is alleged to have taken place, in consequence of obstruction, and yet no jaundice has appeared. (*Thompson on Dis. of Liver*, Am. ed., p 35.) It is, indeed, stated that Tiedemann has observed bile in the lymphatics of the liver, in cases of artificial obstruction of the biliary passages; and the possibility of absorption must, therefore, be admitted. (*Dict. de Méd.*, xiv. 206.) But this fact does not invalidate the arguments above stated, which only go to render improbable this result to any very considerable extent. That the bile should re-enter the circulation by regurgitation, implies a reverse action of the secreting cells, which is scarcely admissible in the present state of our knowledge. A much more probable supposition is, that, in cases of obstruction and consequent accumulation, the pressure made by the accumulated fluid upon the vessels impedes the process of secretion, and thus prevents the due elimination of the yellow colouring matter from the blood. While, therefore, I am willing to admit that absorption may contribute to the production of jaundice in cases of obstruction, I am also inclined to the opinion that, even in such cases, deficiency of secretion is a more effective agent.*

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* Strongly confirmatory of the view that the yellow colouring matter of the bile (*bilifulvin*) results from the disintegration of the red corpuscles of the blood, is the fact, already referred to, that this colouring principle is identical with the hæmatoidin resulting from the decomposition of the red corpuscles of the blood. (See *note*, page 568.)

M. Noel, of Rheims, recommends the following mode of detecting bilious colouring matter in the blood. Dip into serum, which may have been separated from coagulated blood, or obtained by means of a small blister, a piece of Berzelius paper, and, when thoroughly saturated, dry it. Then touch the paper with the end of a glass rod, previously dipped into pure nitric acid. If any of the colouring matter be present, a violet colour will first appear, which will pass into red, and afterwards yellow. (*Journ. d Pharm.*, Sept. 1862.)—*Note to the sixth edition.*

3. *Deficiency of elimination.*—Should the view taken of the existence of the yellow colouring matter of bile in the blood in health be correct, it follows that, when the secretory action of the liver is either suspended, or diminished in a degree greater than that in which the colouring principle is produced, its accumulation in the circulation, and its elimination by other emunctories, are necessary consequences. Such, I believe, is most commonly the origin of jaundice. This view was maintained by myself, in a paper published in the *N. Am. Med. and Surg. Journ.* for Oct. 1826, to which the reader is referred for a statement more at large of the arguments by which it may be supported. The theory may be given in a very few words. The liver is in part an emunctory by which noxious matters in the blood are thrown off. Among these noxious substances is the yellow principle upon which the colour of bile depends, and which is probably formed in the circulation. Through some morbid agency, the secretory function of the liver is impaired or suspended. The yellow matter consequently accumulates in the blood, and, if not thrown off by some other avenue, would derange the vital processes. Nature has provided a remedy for this evil by rendering almost all the other secretory functions sensible to the stimulus of the yellow matter in excess, and capable, under this stimulus, of separating it from the blood. Hence, it passes off by the skin and kidneys, and is deposited in the various tissues, giving its own colour to the secretion and to the tissue; while the want of colour in the fecal evacuations shows its absence from the bowels. The deficiency of bile in the stools may be owing either to its deficient secretion, or to some obstacle to its passage after it has been secreted; though, even where the latter cause exists, it is still probable that the jaundice, in great measure, results directly from the former; the obstacles to excretion operating to suspend or impair the secretory process. But, in the great majority of cases, there is no reason whatever to suspect the existence of any obstruction. Dissections of persons labouring under jaundice at the time of their death have repeatedly shown the biliary passages to be perfectly free, and the liver exempt from organic disease. Under these circumstances, the obstruction has been ascribed to spasm of the ducts. But no proof of the existence of such spasm is offered. The patient often experiences no pain. The disease frequently comes on gradually and continues long, which would not happen were it dependent on spasm. Inspissated mucus or bile, which is thought to be a cause of obstruction, cannot have been so in these cases; for it would have been detected on examination. Besides, in jaundice not connected with inflammation or organic disease of the livèr, there is in general no discoverable distension of the gall-bladder or liver, such as would necessarily accrue from obstruction with a continuance of secretion. In the absence of all proof of such obstruction, and in the face of contrary evidence, we have no right to assume its existence; especially when the phenomena can be otherwise even more satisfactorily explained. The result of treatment is another evidence of the correctness of the views here given; for the most efficient remedies are those which promote the secretion of bile; and effective means, which were considered empirical under the former views of the pathology of the disease, now fall within the limits of rational therapeutics.

It is universally admitted that the bilious colouring principle, when in excess in the circulation, is thrown off by the kidneys, and often exists abundantly in the urine. It may, indeed, be detected in this secretion by chemical tests. On the other hand, there are constituents of the bile which do not pre-exist in the blood, but are made out of it by the liver in the act of secretion. Such, especially, are the biliary acids, the *glycocholic* and *taurocholic*, which have never been detected in the circulation in health. Now these acids are found in the urine in some, though not in all cases of jaundice. As they are not produced in the blood, and never form a part of the ordinary secretion from the kidneys, it follows that they must have been absorbed after being secreted by the liver, and thus reached the kidneys. Upon this basis, Dr. Geo. Harley has suggested an ingenious method of diagnosticating between the cases of jaundice dependent on suppressed or partially suppressed secretion, and those caused by obstruction of the biliary passages. If, on examination of the urine, the presence of one of these acids is detected, it may be fairly inferred that bile has been secreted and reabsorbed, and that, consequently, the case is one of obstruction, as the acids could have come into the urine only after secretion by the liver. If none can be detected, though the evidence is not so positive, yet the probabilities would be decidedly in favour of suppression as the cause of the jaundice.*

With these preliminary considerations, I proceed to a detail of the symptoms, causes, and treatment of jaundice.

Symptoms, Course, &c.—In most cases, the appearance of the characteristic phenomena of jaundice is preceded by symptoms indicative of functional disorder of the liver, and derangement of the digestive organs generally. Such are diminution or loss of appetite, sometimes nausea and vomiting, a vague and indescribable uneasiness in the epigastric and hypochondriac regions, a sense of sinking in the abdomen as if the bowels wanted support, a tendency to constipation, furred tongue, double or otherwise disordered vision, general disquietude, great and apparently causeless depression of spirits, and a disposition to gloomy views of all subjects. These are not all present in all cases; and, in some instances, most of them are wanting. If, after their appearance, the stools be examined, they will be found lighter than natural, perhaps at first of a light-yellow hue as in healthy infants, but afterwards whitish or grayish like potter's clay.

At length the yellowness of the surface makes its appearance In some instances, this is the first observable symptom, and perhaps is generally the first after the patient has been seen by the physician. The colour usually shows itself first in the eyes and face, afterwards upon the neck and upper part of the chest, and ultimately extends over the whole body, being most intense in those parts where the skin is thinnest, and the perspiration most apt to appear, as upon the front of the trunk, and on the insides of the extremities. But there are great diversities in these respects. Sometimes the parts which are commonly the first to be discoloured are the last to be so. Sometimes the yellowness is quite local, and it is even said to have affected one-half of the body longitudinally, while the other half retained its healthy hue. Different shades of colour are said occasionally to appear at the same time on different parts of the body. At first the colour is usually a light-yellow, sometimes a lemon-yellow, which gradually deepens, and at length, if the disease continues, is apt to assume an intense golden or deep-orange hue, which often covers the whole surface. Occasionally the yellowness is modified by a greenish tinge; and, in some comparatively rare cases, the colour is so deep as to approach to blackness; a result which is probably owing in general to a depraved condition of the blood, such as occurs in scurvy. The affection thus characterised is sometimes called *green* or *black jaundice*. In ordinary cases, the yellow hue is often modified by the natural complexion of the patient, being lighter in the fair, and deeper in the brown. The discoloration of the skin is occasionally attended with a very troublesome itching.

The urine, which is at first little changed, after a time becomes yellowish or orange-coloured, but with varying degrees of intensity; being sometimes little deeper in its tint than in health, but generally much darker, like a rather strong infusion of saffron, and occasionally deep-brown or blackish. The darker hues are usually owing to a greater amount of the colouring matter; for the urine, if diluted, becomes bright-yellow. The urine of jaundice may be distinguished from that of nephritic affections by imparting to white linen a bright-yellow stain, which is rendered green by muriatic acid.

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* Dr. Harley gives the following mode of applying Petenkofer's test for the biliary acids. Having added a small piece of white sugar to a little of the urine, pour in a little strong sulphuric acid, but in such a manner that the two liquids shall not mix. After a few minutes, if either of the biliary acids is present, a dark purple hue will be seen at the line of contact. If this line is not produced, or only a brown colour, it may be inferred that the urine contains neither acid. (*Note to the sixth edition.*)

All the other secretions are occasionally more or less tinged with bile, especially the perspiration, which often stains yellow a towel rubbed upon the skin. The milk, however, is rarely affected, and the same may be said of the mucous secretion. The coating of fur on the tongue is often yellowish, and the patient frequently has a bitter taste. Though the conjunctiva is almost always deeply stained, the vision may remain unaffected. Sometimes, however, the colouring matter appears to be deposited in the humours of the eye; and then all objects are seen of a yellow hue.

After the appearance of the yellowness of the skin and urine, I have often observed that the preliminary symptoms diminish, though they still continue in a greater or less degree. The patient is still in general affected with epigastric uneasiness, more or less disorder of digestion, depression of spirits, general languor and indisposition to exertion, and other signs of nervous disorder. The bowels are usually costive, though sometimes regular, and in general readily moved by purgative medicine. The stools are in the great majority of cases whitish, gray, or clay-coloured, from the absence of bile. Though the stomach is frequently disordered, and even nausea and vomiting sometimes occur, yet this is by no means invariably the case; the appetite being in some instances quite natural, and the digestion unimpaired. The tongue is sometimes furred, sometimes nearly or quite healthy in appearance. The skin is usually harsh and dry. The pulse varies much, being either quite natural, or regular, or excited and even febrile, according as the affection is complicated or not with inflammation or active congestion of the liver or other organ. In some cases, the patient complains of more or less pain, tension, &c. in the epigastric or hypochondriac region. This may be either heavy and dull, as when parenchymatous hepatitis or mucous duodenitis exists, or acute and spasmodic, as when the jaundice is dependent on the presence of gall-stones in the biliary ducts. But, in the great majority of cases, the local uneasiness does not amount to pain, and is not inflammatory. In the progress of the complaint, a greater or less degree of drowsiness is not uncommon, probably in consequence of the direct influence of the bilious matter upon the brain. As jaundice may be associated with a great number of organic diseases of the liver or other neighbouring organs, its symptoms must be modified accordingly; and its appearance should always be the signal to the practitioner for a careful investigation into the condition of the abdominal viscera.

A depraved condition of the blood is a not unfrequent accompaniment of jaundice. Sometimes this appears to be simply of an anemic character, sometimes is attended with a hemorrhagic disposition. Both of these conditions may occur with or without organic affection of the liver. Nor is it difficult to explain them. Bile has been ascertained to have a solvent power over the blood corpuscles. (*Carpenter's Hum. Physiol.*, Am. ed., 1850, p. 120.) This explains the anæmia. With the excess of bile in the blood there must be an excess of alkali also, which tends to dissolve the fibrin. Besides, from the experiments of Bernard, it would appear that one of the offices of the liver is to elaborate fibrin out of the portal blood. But a deficiency of fibrin in the circulation is considered as constituting a predisposition to hemorrhage. Hence, jaundice, the existence of which implies an excess of bile in the blood, and deranged hepatic function, may readily be conceived to be occasionally attended with hemorrhage. This complication, however, is not frequent relatively to the whole number of cases of jaundice.

The course of the disease is exceedingly various. Sometimes rapid in its attack and as quickly disappearing, it not unfrequently runs on for weeks and months, and, in some obstinate cases, may even persevere for years. In the vast majority of cases, it either gets well spontaneously, or yields sooner or later to appropriate treatment. Indeed, fatal cases of jaundice are exceedingly rare, unless when it is complicated with incurable organic disease of the liver or adjacent viscera. The first sign of a favourable change is usually the reappearance of the healthy colour of the stools, indicating a restoration of the secretion or excretion of bile. Simultaneously with this change, there is usually a great improvement in the symptoms of digestive and nervous disorder, indicated by a return of appetite, a disappearance of the epigastric uneasiness, and restored cheerfulness. This amelioration is often experienced before the discoloration of surface has been materially diminished. Gradually, however, the yellowness of skin, eyes, and urine disappears; in general receding last from the parts first attacked. The urine at this period frequently deposits a delicate reddish sediment. An itching of the surface, and a slight eruption followed by desquamation, are said sometimes to accompany the disappearance of the yellowness. The symptoms which indicate a fatal termination are usually those which mark the last stages of organic hepatic diseases. Sometimes, however, fatal consequences appear to have ensued from simple functional disorder; either from an excessive accumulation of the excrementitious bilious principles in the circulation, producing on the brain effects analogous to those which result from a too highly carbonized blood, such as delirium, profound coma, and apoplectic phenomena, or from an imperfect condition of the blood, consequent upon a failure of the elaborative function of the organ. The black and green jaundice may sometimes, perhaps, be fatal from this cause; but more frequently their malignancy depends on the profound organic diseases, or total depravation of the blood, with which they are associated. Jaundice is said to be an unfavourable symptom in pregnant women. It is supposed that the enlarged uterus, in advanced pregnancy, sometimes causes jaundice by pressure on the liver; and that the morbid state of other organs, and of the blood itself, arising from the same mechanical cause, adds to the danger of the disease in this condition. Several cases are recorded in the *Revue Medico-chirurgicale* of Paris, in which death with coma took place soon after delivery in women affected with this disease; and M. Carpetier states that eleven cases of the kind had come under his own observation. (*Charlest. Med. Journ. and Rev.*, Nov. 1854, p. 842.)*

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* *Acute Jaundice.*—*Typhoid Jaundice* (Lebert).—*Acute Atrophy of the Liver* (Frerichs).—*Yellow Atrophy of the Liver.*—*Diffused Inflammation of the Liver* (Bright).—Of the severer forms of jaundice noticed in the text, which have long been the objects of observation, and which appear to have had their origin in various sources, there is one variety which, though very rare, has recently been the object of peculiar attention, and has been investigated with so much skill and industry, as to leave little room for doubt as to its claims to be considered, if not as a special disease, at least as a very distinct variety of the disease to which it may be attached. I am myself disposed to consider it, with Dr. Bright, who has the merit of having first called especial attention to it, as a peculiar form of hepatitis, and should have treated of it under that head, but for the uncertainty which yet exists as to its precise nature. Very soon after Dr. Bright's cases, which were first observed in Guy's Hospital in 1832, Dr. Alison, of Edinburgh, published an account of the disease in the *Ed. Med. Journ.* for 1835; both writers having noticed its most remarkable and characteristic feature, that, namely, of the rapid diminution of the dimensions of the liver. Rokitansky afterwards published his views on the subject; and memoirs were written on the disease by Horaczek of Vienna, Bamberger, and Dr. Lebert, the last treating of it under the designation of typhoid jaundice. Dr. Hanfield Jones was the first to notice, in 1847, the destruction of the hepatic cells in large proportion in the disease; and his observations were afterwards confirmed by Budd, Robin, Frerichs, and others. But to Frerichs belongs the credit of having most thoroughly investigated the affection,

From the comparatively moderate disturbance produced, in some cases of jaundice, when there is reason to suppose that the hepatic secretion has been

and of fixing its pathology with the greatest precision. Dr. Wilkes, of Guy's Hospital, has also contributed to our knowledge of the subject. To the valuable work of Frerichs on the liver I am indebted for much of what follows; but, before proceeding further, would guard the student against misapprehension arising from the name of *acute* or *yellow atrophy* given as one of the synonymes at the head of this note. As the term atrophy is used in this work, signifying a mere diminution of the healthy structure, without any change in its character, the disease in question is in no degree entitled to it; as its very essence is a complete change in the elementary structure of the organ affected.

The disease begins sometimes with, sometimes without precursory symptoms; and when such symptoms appear they are in no degree characteristic. They are generally such as indicate gastro-intestinal disorder; as feelings of weakness, a furred tongue, irregularity of the bowels, uneasiness of the abdomen, and sometimes frequency of pulse. Sooner or later a moderate degree of jaundice sets in, which may either anticipate the characteristic phenomena for two weeks or less, or may appear simultaneously with them. After the commencement of these symptoms, the course of the disease is rapid and violent. Among the earliest of them is vomiting, at first of the previous contents of the stomach, then of a grayish mucus, and finally of blood, often like coffee-grounds. At the same time some headache comes on, in general soon followed by delirium, which is in most cases violent; so that the patient screams, throws himself about, and is difficult to restrain. The delirium is usually followed by convulsions, sometimes mingled with tonic spasms, and muscular tremors; and then speedily ends in stupor, passing into profound coma, in which the patient dies. In some cases, instead of the violent delirium and convulsions, the patient is affected with a quiet delirium or stupor, as in typhus, which, though he may be roused for a time, if loudly spoken to, continues more or less to the end. The pulse is seldom much excited during the continuance of the uncomplicated jaundice; but when the nervous symptoms set in, it increases greatly in frequency, sometimes to 120 or 130 in the minute. A remarkable circumstance, in reference to the pulse, is that it undergoes great oscillations, sometimes sinking down to the normal frequency, and, at the same time, changed similarly in strength and volume, and then rising again, until near the close, when it becomes more frequent, smaller, and weaker till it ceases to be felt. The tongue is coated with a dark fur; there is usually tenderness of the abdomen, especially in the right hypochondrium, and the liver is shown by percussion to become smaller and smaller, and not unfrequently ceases to yield any dulness, though there may be no tympanitic distension of the bowels. While the liver is thus shrinking, the spleen is increasing in size. The bowels are usually confined, and the fecal discharges, when obtained, are dry and clay-coloured, or, toward the close, bloody and tar-like. The yellowness of the skin increases with the progress of the symptoms; and at length petechiæ and ecchymoses appear, and hemorrhage takes place from the nostrils, alimentary canal, bronchia, and urinary passages. The urine is acrid and of a brown colour, gives evidence of bilious colouring matter to reagents, and sometimes contains a little albumen. Frerichs found in it also *leucin* and *tyrosin*, with a peculiar extractive matter; while urea and the earthy phosphates were diminished or absent; and this condition of the secretion is found in no other disease. A diagnostic character of the urine, readily observable, is the deposition on cooling of a greenish-yellow precipitate, recognizable by the naked eye, and still better by the microscope, and differing from all other urinary deposits. The disease ends fatally sometimes so early as from 12 to 36 hours after the appearance of the characteristic phenomena, and almost always before the end of the fifth day. From the commencement of the jaundice, the termination in 28 cases was, during the first week in 18, the second in 6, the third in 5, and the fourth in 4. Some doubtful cases of recovery have been recorded; but the disease may be considered as almost invariably fatal.

In reference to the anatomical characters, it is only the liver and spleen that present anything characteristic. The dimensions of the liver are always considerably diminished, sometimes to one-half, or even one-third of the normal size. The diminution takes place in all the dimensions of the gland, but especially in its thickness. The outer coat is opaque, and as it were wrinkled, and the parenchyma soft and flabby, so that it could not support its own weight. In the cut surface, the parts longest affected have an ochre-yellow or rhubarb colour, the blood-vessels are empty, and the traces of lobular structure obliterated. In other spots, in an earlier stage, signs of congestion and extravasation are observable, at least the remains of the latter in the form of crystals of hæmatoidin. Between the lobules surrounded by the congested vessels, lies a dirty grayish-yellow mass, which separates them. At a later period, the congestion disappears, the lobules shrink and become yellow, and the grayish-yellow matter gains the upper hand. At length this matter gradually disappears, the organ assumes a more equable yellow hue, and the indica-than ordinary degree of drowsiness. It has been variously ascribed to pressure of the accumulated meconium upon the common duct, to obstruction of the duct by meconium or inspissated mucus, and to irritation or congestion of the liver sympathetic with an irritation of the alimentary canal; but its cause is not certainly known. Some are disposed to deny its claim to be considered as a variety of jaundice, ascribing it to the congested state of the surface at birth, which terminates in a change of colour, analogous to the yellowness following a bruise. It gives way almost always to gentle laxatives.

Treatment.—In simple jaundice, the most obvious indication is to promote the hepatic secretion; and in the great majority of cases, nothing more is required. As soon as it is discovered, by an inspection of the alvine evacuations, that the bile has begun to flow, and that its flow can be sustained, a speedy cure may in general be calculated on with much certainty.

In order to meet the indication properly, it should be ascertained, if practicable, whether the liver is in a state of active congestion or irritation, or whether it is torpid. If there is pain or a sense of fulness in the side, with tenderness on pressure, the former may be inferred; and, if the pulse is full and moderately strong, blood should be taken from the arm, or by cups or leeches near the tender part, or in both ways conjointly, as circumstances may seem to require. Free purgation with mercurial and saline cathartics, and, if the disease do not now yield, a very moderate alterative course of mercurials will generally be sufficient to complete the cure.

But much more frequently there are no evidences of inordinate excitement of the liver, and the want of secretion must be ascribed to mere torpor, or a state of passive congestion. In this case, the treatment must be directed to the stimulation of the hepatic function. For this purpose a purgative dose of calomel should be given, to be followed in due time by a dose of castor oil. Some recommend a mixture of castor oil and oil of turpentine, in the proportion of half a fluidounce of each; but I have never found the latter substance necessary. Instead of calomel alone, a combination of this with other active cathartics may be employed, as in the compound cathartic pill of the U. S. Pharmacopœia. Sometimes the more energetic action of an infusion of senna may be found advisable. After this, if the strength of the patient remain unimpaired, and the constipation with clay-coloured stools continue, the cathartic may be repeated at intervals of two, three, or four days, until the flow of bile is established; but, generally speaking, the alterative use of mercury alternated with laxatives will be preferable, as equally efficient and less exhausting to the patient. From half a grain to three grains of calomel, or one or two blue pills, may be given every night or every other night, and followed in the morning by two drachms or half an ounce of sulphate of magnesia or bitartrate of potassa, or an equivalent quantity of some other saline cathartic; the object being, in every case, to produce a slight stimulation of the liver, and a gentle action on the bowels, without any observable effect upon the gums, or any exhaustion of the strength. The disease will often yield to this simple plan. Should no evidence of a return of biliary secretion be observed in the course of a week or two, or should the symptoms at the commencement be urgent, it will be proper to resort to other measures. An emetic will often prove serviceable by compressing the liver, and, through its sympathies with the stomach, rousing it into action. Tartar emetic is preferable for this purpose. This remedy, however, is disagreeable, and may generally be dispensed with.

The alkalies are often efficient adjuvants to the alterative course of mercury, probably by stimulating the secretory function of the liver; though by those who believe that the disease arises from obstruction consequent on an inspissated state of the bile, they are thought to act by modifying the condition of that secretion. I have usually preferred the bicarbonate of soda, which may be given in carbonic acid water, in the dose of half a drachm or more three times a day. The carbonate of soda and the carbonate and bicarbonate of potassa may also be employed. The salt of tartar has been a favourite remedy. Soap also has had some reputation; and may be advantageously combined with tonic and laxative pills. Castile or almond soap should be preferred.

Small doses of various emetic medicines also prove serviceable by stimulating the liver to secretion. Tartar emetic, precipitated sulphuret of antimony, ipecacuanha, sanguinaria, and squill have all been used. They would be peculiarly applicable to cases in which there is slight febrile action, especially the antimonials and ipecacuanha. Advantage will occasionally accrue from combining them in the same formula with other medicines useful in the disease, such as the mercurials, antacids, and laxatives.

There are other remedies supposed to have the cholagogue property, which may be used either as adjuvants to the mercurials, or as substitutes. The most efficient of these is probably nitromuriatic acid, which may be used externally during the alterative mercurial course, and internally after it has been for some time suspended. The dandelion and soapwort have some reputation of the same kind, and are occasionally used. Aloes, in purgative doses, is thought by many to stimulate the liver directly, and is certainly a useful remedy in jaundice. With some individuals, it is more efficient than any other remedy in restoring the bilious secretion in a torpid state of the function. Many American practitioners think highly of leptandra, which they believe to be an energetic cholagogue, as well as cathartic. (See *U. S. Dispensatory.*) Podophyllin, also, or the pure resin of podophyllum, has been employed under similar views of its powers; but, though an energetic cathartic, I have not found it to exert any special influence on the hepatic functions. Electricity may also be employed to rouse the torpid viscus.

Not unfrequently the torpor of the liver is associated with a feeble and languid state of the stomach, which probably aggravates the hepatic affection, if it does not lie at its foundation. In such cases, tonics are highly useful. These may be combined very advantageously with purgatives and antacids, and given in conjunction with the alterative doses of mercury, or afterward. Such combinations prove peculiarly beneficial in sustaining the hepatic function, after it has been excited into action by the mercurials. The simple bitters, as gentian, quassia, columbo, and sabbatia, should be preferred. Their extracts, along with aloes, rhubarb, soap, and sometimes a little blue mass or calomel, form excellent combinations. In some cases, particularly those of an anemic character, the chalybeates should be associated with or substituted for the vegetable tonics. The mineral acids are also sometimes useful by promoting appetite and stimulating the stomach.

The narcotics are often highly beneficial, by relieving nervous disorder and producing sleep. Of these, hyoscyamus and conium should be preferred to opium, which has a tendency to restrain the secretion of bile. They may, in general, be used freely; but should not be employed when the head is materially affected. They may be used, among other purposes, for the alleviation of the disagreeable itching, which may also be allayed by gentle friction with rye meal.

Various remedies have been recommended somewhat empirically in jaundice. The late Dr. Chapman found cider and lemonade serviceable. (*Dis. of Thorac. and Abdom. Viscera*, 363.) A mixture of sulphuric ether and oil of turpentine has been highly praised. (See *page* 568.) Ammoniac and assafetida are recommended by the German writers. Sulphate of manganese is said to have proved useful. Certain remedies originally introduced, upon the doctrine of signatures, on account of their colour, have continued to hold a place in the books; as celandine, agrimony, and madder. The popular reputation of the yolk of raw eggs probably had a similar origin. A mixture of the yolk with sulphuric ether has been supposed to possess peculiar efficacy. The most whimsical remedies have occasionally found popular advocates; and I have known the excrement of geese to be strongly recommended. It is probable that the credit enjoyed by many reputed cures for jaundice, has been owing to their employment at a period when the disease was about to subside spontaneously. The late Dr. Peebles, of Petersburg, Virginia, found nitrate of silver a very efficient remedy. He believed it to act by curing chronic inflammation or other disease of the stomach, which may have caused or sustained the hepatic affection.

The treatment applicable to those painful cases in which jaundice is connected with the passage of gall-stones, has been already treated of. (See *page* 567.) When the disease is associated with organic affections of the liver or its appendages, the remedies suited to these affections must be resorted to. When jaundice exists with bilious stools, indicating probable excessive production of bilious colouring matter in the circulation, the treatment should consist of mercurial and saline cathartics, and a vegetable diet.

In obstinate cases of jaundice, and for completing the cure of those which have partially yielded to remedies, the greatest advantage may be expected from a visit to the watering-places, especially to those in which the waters combine chalybeate and purgative properties. I have known the happiest effects from a short residence at the Saratoga springs.

The diet must be accommodated to the circumstances of each case. When excitement exists, it should be confined to vegetable food or to this with milk; but, in most cases, animal food is not only admissible but required. In all cases, indigestible food should be scrupulously avoided. The regimen suited to dyspepsia is also, as a general rule, the best in jaundice not complicated with inflammation. (See *Dyspepsia.*)

SUBSECTION V.

DISEASES OF THE SPLEEN.

THE propriety of considering diseases of the spleen in this place may well be doubted, as it has not yet been satisfactorily shown that this organ has any peculiar secretory function. But in the uncertainty as to its proper office, and from the considerations that it often appears to suffer in common with the liver, and is probably concerned in preparing the blood for the secretory action of that gland, I have thought it best to consider the diseases of the two organs in connection.

Much uncertainty exists in relation to the diseases of the spleen, arising partly from our ignorance of its true function, partly from its low degree of sensibility, and the close vicinity of other highly important organs, which render an accurate diagnosis sometimes very difficult. It is probable that original affections of this viscus are rare, and that, in by far the larger proportion of instances, when diseased, it is so secondarily, in consequence of disease existing elsewhere. While, from its remote position and comparative insensibility, it is little exposed to morbid impressions from without, it is peculiarly liable to suffer from derangements of the system itself. It is composed chiefly of blood, of which its tissue seems to have been intended as a receptacle, and of which it contains variable proportions under varying circumstances, so that it is susceptible of considerable differences of size without any deviation from health. Indeed, a probable conjecture in relation to one at least of its offices appears to be, that it is intended as a diverticulum, for the reception of blood under circumstances which may render the temporary withdrawal of a portion of that fluid from the circulation, or from other organs, desirable. If this opinion is correct, the spleen must be peculiarly liable to suffer indirectly from causes which derange the circulation, or impair the quality of the blood. Thus, if the forces which move the blood fail, if the heart act too feebly, or the capillaries of the liver refuse to forward the blood of the portal vein, accumulation must take place in the spleen, which becomes congested if not inflamed. Hence, it is apt to become enlarged in asphyxia, and in the cold stage of fevers, in cases of hepatic torpor or congestion, and in diseases generally of feeble action, as in malarious cachexy and scurvy. If the blood which it thus receives in excess is diseased, it must suffer also peculiarly from this cause; and hence, possibly, the soft disorganization to which it is liable in malignant fevers, and scorbutic affections. But when disease of the spleen is evident, it may be very difficult to form an accurate judgment of its nature from the symptoms, and sometimes even from dissection. Thus, it is often impossible to decide, in a case of enlarged spleen, whether the disease is simple congestion, or inflammation, or abnormal nutrition, or specific organic derangement; all these affections having certain symptoms in common, and those which ordinarily characterize the inflammatory state being obscure, in this case, from the defective sensibility of the viscus. It is equally impossible, in some instances of post-mortem examination, to determine the precise nature of the lesion discovered; whether, for example, the enlargement is inflammatory, or merely congestive, and whether the softening, so often observed, is the result of inflammation, of the morbid condition of the blood, or of a process analogous to gangrene. The fact is interesting, though as yet not traced out in all its pathological relations, that, in many cases of sudden and unexpected death, the spleen has been observed to be enlarged and softened. In the present state of our knowledge on the subject, it will be most convenient first to treat of those splenic diseases which may be referred to the heads of acute and chronic inflammation, and afterwards to take a brief view of others, which have no claim, or only a very doubtful one to be considered inflammatory. It must be borne in mind, however, that there is no distinct line between acute and chronic splenitis; and that cases frequently occur, which it would be impossible to assign to either division.

Attention has recently been directed to the office of the spleen, and various researches have been made, the general tendency of which has been to show an important connection between that viscus and the process of sanguification; but sufficiently definite results have not hitherto been obtained to serve as a basis for any practical conclusions. That a diseased condition of the spleen and an anemic state of the blood often coexist has long since been observed; and it has of late been discovered that, in many instances, the anæmia is, under these circumstances, of a peculiar character, being distinguished by a great excess of white corpuscles, which has given origin to the name of leucocythæmia attached to it. It is known, too, that the relative proportion of the white corpuscles to that of the red, in the blood of the splenic vein, is greatly increased over the normal proportion in arterial blood. Mr. Henry Gray, of London, states, as the result of his investigations, that the blood which leaves the spleen contains fewer of the red corpuscles than that which enters it, sometimes not more than half as many, whilst the proportion of iron, albumen, and fibrin is increased; but that these effects are not produced in starved animals, showing that one of the offices of the organ is to regulate the quality of the blood. (*Med. Times and Gaz.*, Oct. 1854, p. 375.) The inference from these facts is, that a morbid state of the spleen may have a positive influence in producing that deteriorated state of the blood which is well known to accompany its diseases.

Article I.

ACUTE SPLENITIS.

The peritoneal coat, and the parenchyma of the spleen, may be separately inflamed, or both simultaneously; and the symptoms are somewhat different, though an accurate discrimination during life would be difficult. Such a discrimination, however, is of no great practical importance; for the treatment will be directed less by the exact seat of the inflammation than by the grade of the local symptoms, the state of the circulation, and the previous condition of the constitution. In general terms, it may be said that inflammation of the outer coat may be suspected, when the pain is acute, and the fever considerable; of the parenchyma, when the pain is obtuse, and the viscus enlarged; of both conjointly, when sharp pain and enlargement exist at the same time.

Symptoms, Course, &c.—The most characteristic symptom of acute splenitis is pain deep in the left hypochondrium, sometimes sharp or throbbing, sometimes vague and dull, occasionally extending to the left shoulder, or shooting into the neighbouring parts of the abdomen, and almost always increased by pressure over the region of the spleen. It is also generally increased by coughing, and by a deep inspiration; and is most troublesome when the patient lies upon the affected side. In some cases, instead of pain, there is only a feeling of weight, fulness, or tension; and even this may be absent, so that the disease can be detected only by a close examination, which will generally reveal the existence of tenderness under pressure, and a certain degree of enlargement. But, as the tumefaction of the spleen is much greater and more striking in the chronic than in the acute form of the disease, it will be more conveniently treated of under the former head.

The onset of the disease is usually marked by a chill, followed by fever, which may have the continued, remittent, or intermittent type. It is a question whether the splenitis is ever the original affection when the fever is distinctly intermittent. Generally, it is no doubt secondary under such circumstances; but cases are on record in which the fever has been intermittent, though the inflammation of the spleen was the result of local violence. Nevertheless, even these cases may not have been exceptions to the general rule; for there may have been a predisposition to fever and ague, which the injury called into action.

Besides the phenomena mentioned, there are often others dependent on derangement of the neighbouring organs. Epigastric uneasiness, nausea, and vomiting are not uncommon; and in very severe cases the vomiting is incessant, and constitutes one of the most prominent symptoms. In consequence of the extension of irritation to the diaphragm and lungs, or of the upward pressure of the enlarged viscus, the patient is sometimes affected with cough, dyspnœa, and hiccough; and irregular action of the heart or palpitation may occur from a similar cause. The bowels are usually costive; but sometimes they become involved in the irritation, and diarrhœa or dysentery results. Vomiting and purging of blood occasionally attend the disease. The liver is often functionally deranged, and the occurrence of urinary disorder evinces sometimes a sympathetic irritation of the kidneys. Depression of spirits, headache, and delirium are mentioned among the occasional symptoms.

The condition of system may be sthenic or asthenic. In the latter case, the splenitis is generally secondary, connected with low and malignant fevers, or with a depraved condition of the blood, as in scurvy. Its symptoms have, moreover, in general, little prominence; and often nothing occurs during life to call attention especially to the spleen, which after death is found completely disorganized. In such cases, the grade of inflammation is low; and it is even doubted whether there is anything more than a mere congestion, with a dissolution of the tissue consequent upon its feeble vitality.

In the great majority of cases, simple inflammation, under proper treatment, terminates favourably in resolution. Sometimes, however, it is otherwise, and violent cases may end fatally in a week or ten days, or a shorter time; death being preceded by hiccough, tympanites, diarrhœa, delirium, and general collapse Other cases run on to suppuration, which usually takes place in eight or nine days, and is marked, though obscurely, by a diminution or alteration of the pain, by rigors, relaxation of the surface, and a disposition to sweat at night. The patient may die before the pus is discharged, or he may get well in consequence of its absorption. But occasionally the pus escapes from the spleen, and is either discharged into the cavity of the peritoneum, producing fatal inflammation of that membrane, or makes its way posteriorly or anteriorly into or through the abdominal parietes, or finally penetrates into the lungs, stomach, or bowels, and thus finds an external outlet. In either of these latter events, recovery may take place, though it is always doubtful and tedious.

From the contiguity of various important organs, splenitis is liable to be confounded with other diseases, especially with inflammation of the left lobe of the liver, of the stomach, of the pleura, of the colon, and the kidneys. Even rheumatism of the muscles in the vicinity may be mistaken for it, without care. But, when the spleen is in its natural position, a close observation of the seat of pain and tenderness, taken in connection with the signs which indicate enlargement of the viscus, as well as those which characterize the several inflammations alluded to, will generally enable the practitioner to come to a just conclusion. What tends more than anything else to embarrass the diagnosis, is the simultaneous existence of high irritation or inflammation of one of the organs referred to, which obscures and sometimes completely masks the splenic disease. Perhaps the affection most liable to be confounded with splenitis is pleurisy, seated in the lower angle of the chest. The pain, increased upon inspiration, the cough and dyspnœa, and the dulness on percussion extending further upward than in health, which attend splenitis, especially when it occupies the upper surface of the viscus, are all likewise found in pleurisy. But the absence of ægophony and the pleural friction sound, the extension of the dulness downward into the abdomen, and its unvarying limits with every change of position, and the occasional decubitus on the left side, will serve sufficiently to characterize the affection of the spleen. It should be noticed, however, that, when the upper surface of the spleen is the seat of the inflammation, a friction sound may result from its contact with the diaphragm. Rheumatism will, in general, be readily distinguished by the pain which accompanies the movements of the trunk.

Anatomical Characters.—When the patient dies early, the spleen is found larger than in health, of a dark-red or blackish colour, and very soft or friable, so that it yields readily to pressure with the finger. Here and there may be observed lighter spots indicative of commencing suppuration. If death has been delayed until after this process has been established, pus is discovered either infiltrated through the tissue of the viscus, or collected in isolated cavities, which vary much in number and size. When there is only one abscess, this is sometimes very large, occupying the greater part, or even the whole of the spleen, and in the latter case filling completely the investing capsule. The pus is often intimately mixed with blood. Sometimes marks of gangrene are present, though these are very rare; what was formerly taken for gangrene being nothing more than black softening of the tissue, without putrefactive smell. Sometimes the surface of the spleen is covered with coagulable lymph, and in old cases it is found adhering to the neighbouring viscera.

Causes.—External violence: severe and continued muscular exertion, as in running for a long time; metastasis of other diseases, as of gout, rheumatism, and various affections seated in the skin; suppression of hemorrhoidal, menstrual and other habitual discharges; sudden mental emotions of a depressing nature, as terror; and the extension of inflammation from contiguous organs, are ranked among the causes of acute splenitis. Whatever produces sudden portal congestion may have the same effect, by retarding the return of the blood from the spleen. In this way it probably is that miasmatic and malignant fevers produce splenitis; the blood accumulating in the viscus during the chill. Hepatic congestion and inflammation operate in the same way.

Treatment.—The treatment must be directed upon the same general principles as in other inflammations. Bleeding, general and local; active purgation, first with combinations of calomel and other cathartics, and afterwards with saline purgatives or senna; warm fomentations or cataplasms, and the warm bath; and, after these, blisters, repeated if necessary, are the remedies adapted to open and well-developed cases of the disease, with a strong and accelerated pulse. The whole antiphlogistic regimen must be at the same time observed. If there should be nausea and vomiting, the effervescing draught may be employed, with or without opiates, as circumstances may seem to require. Should the stomach, on the contrary, be retentive, and at the same time the fever considerable, the antimonials may be prescribed in diaphoretic doses. Incidental symptoms, as those of diarrhœa and dysentery, must be encountered by methods suitable to the several affections they indicate.

But, in many cases, the condition of system will not admit of a decided depletory course. Here leeches or cups should be substituted for the lancet; and the purgatives employed should be of the less exhausting kind, as rhubarb and aloes, with or without calomel, according as the hepatic function may be impaired or otherwise.

Mercury, as an antiphlogistic remedy, is less applicable to this than to most other visceral inflammations. When, however, a frank attack, in a patient of vigorous constitution, does not yield to the usual antiphlogistic remedies, I should have no hesitation in employing mercury carefully, with a view to its impression upon the system. But in the disease as it, perhaps, more frequently occurs, with a depraved state of the general health, and especially of the blood, mercury might prove injurious by still further breaking down the vital forces, and thus favouring congestion of the spleen.

Should the disease be associated with intermittent fever, sulphate of quinia must be resorted to, without further delay than such as may be requisite for the clearing out of the bowels. By arresting the paroxysms, and thus preventing that periodical congestion of the spleen which occurs with every chill, it will prove much more serviceable, in relieving the inflammation, than it possibly can prove injurious by its stimulant action. There is no incompatibility whatever, in such cases, in the joint employment of quinia and the lancet, or other depletory measures, should the latter be indicated.

Article II.

CHRONIC SPLENITIS.

UNDER this head I include those chronic enlargements of the spleen which frequently attend intermittent fevers, and are commonly called *ague cakes*; for, though it is not certain that they are always inflammatory, yet that they often are so in their origin or progress is undisputed, and it is impossible in any one instance, during life, positively to deny them this character.

Symptoms, Course, &c.—Chronic splenitis occasionally occurs with so few symptoms as altogether to escape notice, and is first known to have existed upon post-mortem examination. In general, however, it is sufficiently characterized by its phenomena. There is often a feeling of weight, tension, or other uneasiness in the left hypochondrium, sometimes amounting to positive pain, which is almost always increased by pressure, and is usually greater when the patient lies upon the right side. As in the acute inflammation, it is also sometimes felt in the left shoulder. But the most characteristic symptom is enlargement of the viscus. This is often obvious to the most superficial examination, and, when not so, may usually be detected by percussion. This enlargement occasions various inconveniences, not only incommoding the patient by its weight, so as occasionally to produce an inclination towards the left side in standing, and to influence the gait in walking, but embarrassing very much by its pressure the functions of the neighbouring organs, as the lungs, heart, stomach, and intestines, in addition to the disorder from sympathetic irritation. Hence, the complaint is often accompanied by cough, dyspnœa, palpitations or other irregular action of the heart, impaired digestion, and consequent general emaciation. The hepatic and renal functions are also frequently deranged. The skin is apt to be sallow, and sometimes has a dusky or greenish hue. If to these symptoms we add a frequent tendency to irregular febrile action, and to hemorrhage, especially from the stomach, lungs, and nostrils, we have a tolerably full picture of the complaint. If not relieved, it produces a gradual exhaustion of the vital powers, with hectic symptoms or dropsy, and at length death, amidst the usual phenomena of fatal abdominal diseases, such as vomiting and purging, stomachic and intestinal hemorrhage, anxiety, restlessness, and delirium.

The disease is of very variable duration, lasting only a few months, or running on for years, and sometimes continuing, in its milder and more inert forms, even to the end of a long life, without any very great inconvenience. In miasmatic countries, many individuals are affected with enlarged spleens or ague cakes, without seeming to heed them. In such cases, the tumour appears to be quite indolent, though capable of being roused into dangerous activity by causes calculated to induce acute splenitis, especially by blows, or falls on the side, or other external violence. According to Mr. Twining, children are not so well able to support the disease as adults, and perish under a degree of it which might be resisted by more hardened constitutions.

As chronic splenitis prevails in miasmatic regions, it is often associated with a peculiar cachectic condition of system, with a depraved constitution of the blood; though it is difficult to say how far this state of health bears to the splenic disease the relation of cause or effect, and how far they are both coincident results of the same morbid cause acting upon the whole economy. It is, on the whole, probable that both the disease of the spleen and the cachectic state of system are common effects of the same cause, though they may tend to sustain and aggravate each other. The constitutional affection alluded to is characterized by a pale anemic condition of the skin, which is also sallow, dry, and shrunken; by general lassitude, inertness, muscular weakness, and mental depression; by great liability to hemorrhages, and to sloughing ulcers of the legs from slight injuries; by pains in the limbs, sometimes followed by collections of pus; by amenorrhœa in the female; and by a tendency to general dropsical effusion, or œdema of the lower extremities.*

The enlargement of the spleen occurs in various degrees. Sometimes it scarcely projects beyond the lower edge of the ribs, and can then be detected only by the flatness upon percussion, which extends further upwards than in the normal state of the viscus. Most commonly, however, the tumefaction is very obvious, reaching beyond the ribs various distances into the lumbar, umbilical, and epigastric regions, and sometimes descending as low as the iliac fossa and hypogastrium, and occupying nearly the whole cavity of the abdomen. In this condition, the spleen is usually in the form of a hard, smooth, oblong, and somewhat movable tumour, rounded on the outer side, and presenting on the inner a more or less attenuated edge, running downward from the epigastrium or near it towards the left flank, and often somewhat notched. This is the ordinary state of the tumour in very chronic cases, in which there has been much organic change. In others, which approach more nearly to the acute form, and in which the swelling is probably dependent chiefly upon congestion, the tumour is less oblong and more rounded, is softer to the touch, and yields more readily to treatment.

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* The coexistence of the anemic state of the blood and enlarged or hypertrophied spleen, so often observed, may in some degree be explained upon the hypothesis that one of the offices of the spleen is to destroy the red corpuscles; an hypothesis strongly supported by the observations of Mr. Henry Gray, that the blood leaving the spleen is much less rich in these corpuscles than that which enters it. (*On the Structure and Use of the Spleen*, Lond., 1854.)—*Note to the fourth edition.*

Sometimes other tumours are mistaken for enlarged spleen, and a mere displacement of this viscus by fluid distending the pleura, may give rise to the impression that it is larger than in health. The affections most liable to be thus mistaken are tumours of the omentum, peritoneum, and abdominal parietes, and enlargement of the left lobe of the liver. But by bearing in mind the shape of the diseased spleen, the normal position of that viscus, and its relation to the neighbouring viscera, as well as the ordinary course of chronic splenitis, and the characteristic phenomena of the other affections alluded to, the practitioner will almost always be able to arrive at a correct conclusion.

Dissection.—The peritoneal coat of the spleen is often found adhering to that of the stomach, colon, or kidneys, and the proper coat to have assumed, in patches more or less extensive, a cartilaginous or osseous character; and these degenerations sometimes follow the capsule in its cellular extensions through the interior of the viscus. The spleen itself is enlarged in various degrees, sometimes enormously so, weighing from ten to twenty pounds, or more. The parenchyma exhibits various changes of structure, not unfrequently even in the same case, being indurated, hypertrophied, or congested, sometimes soft with purulent infiltration, and sometimes presenting cavities filled with pus or effused blood, or variously coloured liquids of a similar origin.

Causes.—Chronic splenitis sometimes succeeds the acute; but is more frequently original. Its most common cause is intermittent fever, of which it is a very frequent result, when that disease is long continued. The spleen becomes congested during the chill, is partially relieved upon the occurrence of the fever, is again congested in the subsequent paroxysm, and thus goes on, alternately distended with blood and incompletely unloaded, until at length organic change and permanent enlargement take place. The disease also sometimes follows bilious remittent fevers; and it is thought occasionally to result directly from the miasmatic influence, without the intervention of fever. Retention or suppression of the menses is believed to favour its production. In fact, anything capable of maintaining a continued portal congestion may serve as a cause of chronic splenitis; and most of the agents already enumerated, as producing the acute form, may produce also the chronic when acting more moderately and for a longer time.

Treatment.—General bleeding is seldom required or admissible, unless when acute inflammation supervenes upon the chronic. Local bleeding by cups or leeches should be employed when there is pain or tenderness in the side, without an anemic or very debilitated state of system, and especially if fever exist. In some instances, it may be advantageously repeated several times in the same case. Most frequently, however, the complaint is associated with a state of health which is incompatible with much direct depletion. The French authors recommend leeches to the anus.

Purging is, in general, a safer and more efficient measure. Medicines should be preferred which are capable of producing a powerful revulsion to the alimentary canal, without greatly debilitating. Jalap and cream of tartar, senna, rhubarb, and especially aloes may be employed, the last being useful by its action upon the hemorrhoidal vessels. The compound extract of colocynth is an excellent combination, when the bowels are somewhat indolent. Tartar emetic is sometimes advantageously combined, in small doses, with the purgatives, to promote their action, and is especially applicable when there is fever. If the liver should not act sufficiently, calomel should be added to the other cathartics. In debilitated cases, the purgative tinctures, as those of aloes, senna, and jalap, may be added to or substituted for the medicines in their ordinary form. The cathartic may generally be repeated every second or third day. When given in moderate doses, so as to act rather as a laxative than a purgative, it may be repeated daily. Of course, in cases complicated with diarrhœa, cathartics must be employed cautiously if at all.

The mercurial impression is less useful in this than in most other instances of chronic inflammation. Calomel, the mercurial pill, or iodide of mercury, may be resorted to in minute alterative doses, when the hepatic action is deficient or deranged; but care should be taken that it be not carried so far as to affect the gums. Though, in some cases in which the general health is not materially impaired, the impression of mercury on the system might prove useful; yet the disease is so often associated with a depraved or cachectic state of system that it would generally prove injurious by increasing the debility, and still further depreciating the character of the blood. This has been sufficiently proved by observation; and the employment of mercury, formerly recommended in this disease as in hepatitis, is now deprecated by the most experienced practitioners.

Upon the whole, the most efficient remedies, in connection with purgatives, are tonics and astringents. Sulphate of quinia is highly useful. In cases complicated with intermittent fever, it often speedily effects a cure by removing the cause. But in malarious cases, in which there has been no fever, or the fever has been subdued, sulphate of quinia has still exerted a most favourable influence, continued for a considerable time, in doses of from six to twelve grains in twenty-four hours. Other bitter tonics may be substituted, when the indication is especially to improve the digestion. It is probable that nux vomica would prove useful, as, among the effects which have been observed to follow its poisonous action in animals, is a marked diminution in the size of the spleen. The chalybeates have a high and merited reputation in chronic splenitis. They not only act by improving digestion, correcting the anemic condition of the blood, and thus producing a tonic impression on the general system; but they are believed also to have a direct effect upon the spleen, which they are asserted to diminish in bulk in health, and still more when morbidly congested. The salts of manganese may also be employed, as having a similar influence on the blood; and the sulphate has been particularly recommended.

These remedies may be variously combined in the same prescription, so as to suit the circumstances of each case. Thus, aloes, extract of jalap, or compound extract of colocynth, and protocarbonate of iron may be given in pill, to which sulphate of quinia, or extract of gentian or quassia, and one of the mercurials may be added if requisite; or, if it be desirable to administer the medicines in a liquid form, senna or aloes may be combined with one of the bitters and some aromatic in infusion, and one of the soluble or liquid preparations of iron, as the sulphate, tincture of the chloride, or solution of the iodide, may be added; and the whole rendered more stimulating, if thought advisable, by one or more of the purgative, tonic, or aromatic tinctures. A preparation of this kind is recommended by Mr. Twining, as having proved efficient in the chronic splenitis of Bengal.*

Another remedy which seems strongly indicated in chronic splenitis is iodine; and it has sometimes been employed with much apparent advantage. It may be used internally, or externally, or both. Perhaps for internal use the iodide of iron would, on the whole, be the best preparation; though the compound solution, or compound tincture of iodine, the iodide of potassium, or the iodide of mercury, may be substituted when circumstances seem preferably to call for any one of them. The ointment of iodine should be rubbed freely, daily or twice a day, upon the abdomen over the whole surface of the tumour. Bromide of potassium is said also to have the property of reducing the enlarged spleen. Dr. Robert Williams, of whom Mr. Spencer Wells said that he was one of the most philosophical physicians of the age, had great confidence in this remedy. (*Med. Times and Gaz.*, July, 1858, p. 91.)

Piorry states, as the result of his observations, that common salt (chloride of sodium) has the property of diminishing the bulk of the spleen whether in its normal state or hypertrophied. He gives from two to six drachms dissolved in ten times the weight of water. (*Arch. Gén.*, *4e sér.*, xxviii. 344.)

Other local measures may be resorted to. Repeated blistering is sometimes serviceable; but the remedy should be used with caution; and not at all in those cachectic and scorbutic cases in which there is a tendency to slough. With the same restrictions, setons, issues, or pustulation with tartar emetic, may be employed. Friction over the abdomen is sometimes useful; and a broad flannel roller should be worn around the body, in order to sustain a proper temperature of the surface, and to afford mechanical support. Warm bathing should be used in cases attended with fever.

The diet should be regulated by the state of the system. In some febrile cases, it may be proper to restrict the patient to vegetable food; but much more generally a nutritious animal diet is requisite, in order to support the strength, and repair the character of the blood. In doubtful cases, milk may be added to the vegetable food. In all cases, the food should be of easy digestion. (See *Dyspepsia.*)

Moderate exercise, attention to the clothing, and a pure air are valuable adjuvants in the treatment. All that has been said, under chronic hepatitis, in relation to watering-places, may be considered as applicable here.

Various other remedies besides those enumerated have been employed. In Bengal, where the disease prevails, the natives use garlic and expressed oil of mustard, with chalybeates and aloes. They also employ the actual cautery, and practice acupuncturation of the spleen with very long needles. Nitric and nitromuriatic acids have been recommended in combination with purgatives. Muriate of ammonia in large doses is favourably spoken of in Eberle's Practice, as is also tartar emetic used in small quantities in weak solution as drink. Repeated emetics are said to have sometimes succeeded in reducing large spleens, and cataplasms of tobacco leaves over the enlarged viscus have been advised. Mechanical methods, such as gentle percussion and kneading of the spleen with the hand, have had their advocates; but they are obviously applicable only in the absence of all tenderness, and when there is reason to believe that the viscus is indolent rather than inflamed.

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* ℞.—Pulv. Jalap., Pulv. Rhei, Pulv. Colombæ, Pulv. Zingiberis, Potassæ Bitartratis, āā ʒj, Ferri Sulphatis ℈ss; Tinct. Sennæ fʒiv; Aq. Menth. Sativ. f℥x. Misce. The dose is a fluidounce and a half for an adult, repeated twice a day, at 6 A.M., and 11 A.M., to be reduced proportionably for children, so as to produce three or four stools daily. This is to be continued for three or four weeks or longer, if necessary, with occasional intermissions when found to disagree with the patient. Should the patient be feverish, it is to be omitted until this state is corrected.

Article III.

NON-INFLAMMATORY DISEASES OF THE SPLEEN.

Congestion.—The spleen is peculiarly liable to become engorged with blood, either from irritation in the viscus itself, or from causes operating from without. When active, the congestion is often but the incipient stage of inflammation; and probably, even when passive, it produces in time a low and imperfect grade of that affection, which may end in serious organic changes of the viscus, as in intermittents. Sometimes, however, congestion exists without any evidence whatever of inflammation.

The symptoms during life are not very obvious, and the affection not unfrequently entirely escapes notice. There may be a feeling of fulness, weight, or tension in the side, with oppression of the chest, and possibly sometimes prostration from the sudden withdrawal of blood from the general circulation; but in most cases of debility connected with congested spleen, the state of system is dependent on other causes, and is itself the cause rather than the consequence of the congestion; the blood accumulating in the spleen, because the heart has not force enough to carry it forward as fast as it is returned by the veins. Along with the sensations alluded to, a close examination will detect enlargement of the viscus; and the absence of pain or tenderness will render it probable that the enlargement is not inflammatory. In some instances, the spleen has been ruptured by its excessive distension, especially when previously more or less disorganized; and the blood, escaping into the cavity of the abdomen, has produced death suddenly, either directly from hemorrhage, or indirectly from severe peritonitis.

All prostrating influences may occasion congestion of the spleen in an ordinarily full condition of the blood-vessels. Hence it takes place in fainting, and in the cold stage of fevers, especially those of miasmatic origin; and, in the latter case, the distension is sometimes enormous, especially in malignant intermittents and remittents. Any impediment to the transmission of the blood of the vena portarum through the liver, or any obstruction to the entrance of the blood into or its transmission through the right cavity of the heart, may have the same effect. Rapid running, and excessive muscular exertion of any kind are liable to produce congestion of the spleen; and that viscus is said to have sometimes been ruptured from this cause.

Upon dissection, the spleen is found to be considerably enlarged, of a deep-brown almost black colour, and engorged with blood. Sometimes the blood is extravasated, and exists infiltrated into the tissue, or collected in one or more cavities as in apoplexy. Occasionally, in old cases of splenic disease, cicatrices and fibrous cysts have been observed, which are supposed to be the remains of similar lesions; the effused blood having been absorbed or become organized.

Congestion of the spleen is very seldom fatal or even serious of itself; and, in the fatal cases in which it has been observed, death has usually resulted from other causes. It may, however, prove injurious by laying the foundation of inflammation, or disorganization of some other nature; and when discovered, therefore, merits attention. If it be of an active character, bleeding may be employed. In other cases, emetics will be found very efficient, and these should be followed by cathartics. In debilitated states of the system, tonics may be employed as mentioned under chronic splenitis, and the chalybeates with sulphate of quinia are the most efficient.

Softening.—The texture of the spleen is softened by acute inflammation; but there is another kind of softening which is not attended by inflammatory symptoms during life, and exhibits, on dissection, no other evidence of this process than its own existence. It is generally associated with congestive enlargement of the spleen, but not universally so. The increase of bulk is various in degree, and never so great as in many cases of enlargement with induration and hypertrophy. The viscus seldom much exceeds three or four times its usual size, though occasionally it has attained the weight of seven or eight pounds. The degree of softening is also very different in different cases. Sometimes the consistence is but slightly altered; sometimes the whole parenchyma is converted into a liquid or semi-liquid disorganized mass, like a loose clot of blood contained in a membranous bag. In the latter case, the spleen will even break or tear if lifted in the hand; and the finger can be run through it in all directions, almost without resistance. The interior mass is sometimes a black gore, sometimes a pulpy matter like mud, varying, in its shades of colour, from a light gray to a dark almost blackish brown. In some instances, the fibrous tissue which gives its cellular structure to the viscus remains; in others this also is disorganized.

This affection occurs in the course of various diseases in which the blood is altered, especially scurvy and low forms of fever. It is a very frequent accompaniment of typhoid fever. The nature of the softening is not well understood. It may be ascribed to a feeble inflammation which the vitality of the tissue could not resist; but opposed to this supposition is the fact stated by Louis, that, in all the cases observed by him in typhoid fever, he found the whole tissue of the spleen affected, without any marks of inflammation of the peritoneum, and without pus. It is more probably owing to the diseased state of the blood, which, accumulated and retained in the spleen, cannot sustain the feeble vitality of the tissue, and therefore acts in some measure the part of a solvent.

No therapeutical measures are required in this affection other than such as are indicated in the treatment of the diseases with which it is associated.

Hypertrophy and Atrophy.—The spleen is sometimes enlarged by excessive growth, without any material alteration of its structure. This may be owing to a gentle irritation, not exceeding the nutritive point, sustained by an undue supply of blood. It is said sometimes to occur in intermittents; but there are no symptoms by which it can be distinguished from other enlargements of the viscus attended with organic derangement. The spleen is also occasionally found much diminished in size; and instances have occurred in which it was little larger than a walnut. The diminution is generally attended with a loss of colour, and a comparatively bloodless condition. The causes of this extreme atrophy are unknown. In some instances of a more moderate kind, it may be supposed to be owing to a contraction of the capsule of the spleen, consequent upon inflammation or other organic change.

Tubercles have been noticed in the spleen, but they are rare. *Cysts and hydatids*, undergoing the same changes as in the liver, sometimes exist, but are also rare. The same may be said of *carcinoma* or *cancer*. Out of upwards of nine thousand cases of this disease which occurred in the department of the Seine, in France, in ten years, according to the table of M. Tanchou, only thirteen were in the spleen. (Lebert, *Malad. Cancer.*, p. 92.) *Melanosis* is occasionally observed. The *fatty* and the *waxy*, *lardaceous*, or *amyloid degenerations* have also been noticed; and, in the waxy spleen, the new matter has been observed to yield a blue colour with iodine and sulphuric acid; a reaction characteristic of cellulose. (*Ed. Month. Journ. of Med. Sci.*, April, 1854, p. 381.) *Calculous concretions* have also been found. But none of these affections are of practical importance; as, independently of their rarity, they present no signs by which they can be detected in life. The spleen is sometimes *displaced* from its natural position by the pressure of abnormal growths or collections of fluid in its neighbourhood; and has been known to be entirely dislocated without any assignable cause. An example of the latter affection is noticed by Dr. Dunglison, in which the viscus is found resting on the brim of the pelvis, retaining its peritoneal and vascular connections, and freely movable in all directions. (*Cyc. of Pract. Med.*, Philadelphia, 1844, article *Diseases of the Spleen.*) It has already been stated that the spleen may be ruptured by excessive congestion, especially when previously diseased. Many cases have been recorded of *rupture of the spleen* from violence, either direct as by a blow, or indirect through excessive straining. In these cases the organ has almost always been previously enlarged, and otherwise diseased, either softened or abnormally brittle. Death ensues in general very quickly from hemorrhage, or less quickly, perhaps, from peritonitis.

SUBSECTION VI.

DISEASES OF THE URINARY ORGANS.

Article I.

INFLAMMATION OF THE KIDNEYS, OR NEPHRITIS.

INFLAMMATION of the kidneys, in its different grades and varieties, is not uncommon. It may be seated in the investing coat of the gland, in its substance, in the mucous membrane lining its pelvis or calyces, or in two or more of these parts conjointly. The capsule is seldom inflamed unless in connection with the parenchyma. The part most frequently affected is probably the pelvis with the calyces. Rayer has given different names to the disease occupying these different sites. Inflammation of the substance of the gland he calls *nephritis*, of the pelvis and calyces *pyelitis*, of the coat *perinephritis*, and of the glandular parenchyma and pelvis conjointly *pyelonephritis*. But this refinement of nomenclature is of little practical importance. It seldom happens that one part is much inflamed without some participation of another; and an exact diagnosis is very often difficult if not impossible. The treatment, moreover, is directed much more according to the violence of the symptoms, and the origin of the disease, than its precise locality. Nephritis has also been divided into varieties in reference to its causes; as into *the simple* form produced by the ordinary causes of inflammation, *the calculous* when resulting from urinary concretions, and *the gouty* when of an arthritic origin. But there is no such practical or essential difference in these cases as to call for distinct designations. The most important division is probably into the *acute* and *chronic*, though these two conditions of the disease are often very indefinitely separated.*

Symptoms of Acute Nephritis.—The most prominent symptom of acute nephritis is usually a deep-seated pain in the small of the back, upon one side or upon both; sometimes sharp and severe, sometimes heavy, obtuse, or burning; often extending downward, in the direction of the ureter, to the groin, neck of the bladder, scrotum, or even the inside of the thigh; increased by firm pressure over the region of the kidney, sudden jars, quick change of position, bending forward in the sitting posture, severe coughing or sneezing, or a full inspiration from any cause; and frequently accompanied with a retraction of the testicle, with some tenderness of that organ. It is said that, when one kidney only is affected, the patient lies most comfortably on the opposite side. Along with the pain, there is occasionally a feeling of numbness in the thigh. If the patient lie on his face with the knees drawn up, the kidney may in thin subjects be grasped by the hands, and will generally be found tender, and, in cases of inflammation of the parenchyma, somewhat enlarged.

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* Another inflammatory affection of the kidneys is that called by Dr. Geo. Johnson, of London, *desquamative inflammation*, because seated especially in the uriniferous tubules, and producing a desquamation of the epithelial lining of these passages. It constitutes one of the morbid conditions of the kidneys in Bright's disease, and will be specially considered under that head in the following article.

The patient has in general a disposition to micturate frequently, though the reverse is sometimes the case. The urine passed is very scanty, usually high-coloured, and more or less mixed with blood, sometimes albuminous even when it contains no blood, and not unfrequently contaminated with mucus, and with calculous matter, which is deposited upon standing. In some instances, however, when the substance of the kidney is exclusively affected, or when the urine which escapes is derived from the sound kidney, in consequence of obstruction upon the diseased side, the secretion is clear and of a healthy colour. When both kidneys are affected, the urine is sometimes almost or quite suppressed; and then comatose symptoms are apt to supervene.

Acute nephritis is almost always attended with fever, the antecedent rigors of which, in severe cases, set in simultaneously with the pain, or even before it. In other cases, the pain and signs of urinary disorder occur before the constitution has begun to sympathize. Sometimes the fever is very high, with headache, furred tongue, thirst, a hot dry skin, and a strong pulse; sometimes it is slight. It is generally remittent, and is asserted occasionally to have the intermittent form.

The stomach is almost always disordered in bad cases. Nausea and vomiting are very frequent; and it is said that the vomited matter sometimes has a urinous smell. The bowels are in most instances constipated.

When the substance of the kidney is exclusively affected, the urine is free from obvious mucus, and usually from gravelly deposit. If, upon examination by the microscope, it be found to contain fibrinous casts of the uriniferous tubes, the inference is highly probable that the cortical portion is inflamed. The gland is also more tender under pressure, in proper nephritis, than when the mucous cavities only are diseased.

In the *pyelitis* of Rayer, or inflammation of the pelvis and calyces, the testicle is more frequently retracted than in the other case, the renal secretion is not so much diminished, and is never quite suppressed, the urine is more or less mixed with mucus, and in the advanced stages with pus, and, when the disease is associated, as it generally is, with gravel, the same liquid frequently abounds also in calculous matter. In some instances, however, in which the concretion serving as the source of irritation consists of oxalate of lime, the urine is free from calculous matter, though loaded with mucus.

When nephritis is of calculous origin, the pain is often very acute and spasmodic, suffering exacerbations with the movements of the calculus in the pelvis of the kidney, and sometimes excited into excruciating violence upon its entrance into or passage through the ureter. The presence of calculous deposit in the urine, the sudden cessation of pain evincing the entrance of a stony concretion into the bladder, and the escape of such a concretion from the urethra are further proofs of the peculiar nature of the affection.

The gouty form of nephritis may be known generally from the constitutional habit of the patient, and is sometimes strongly characterized by occurring upon the retrocession of the disease from some external part. It may be recognized also by the character of the urine, which is high-coloured, and, while in the other varieties it is usually deficient in uric acid, and either neutral or alkaline, in gouty nephritis usually abounds in that principle, which it deposits copiously, upon cooling, in the shape of earthy or sandy gravel.

In its more acute forms, nephritis is often very rapid, either ending in resolution, or evincing signs of suppuration, or other unfavourable phenomena, in the course of a week. In the first case, the pains diminish, the urine becomes more copious and blood is sometimes discharged from the urethra, the fever abates, the skin relaxes, the stomach is composed, the tongue begins to clean, and health returns sometimes in four, five, or six days. Occasionally the disease subsides without disappearing, and runs into the chronic form.

The occurrence of suppuration is marked by rigors, some change in the character of the pain, a weaker pulse, a relaxed skin, and sometimes sweats at night. In some instances, the urine becomes at first turbid, and then gradually yellowish and opaque, obviously owing to the presence of pus. In others, the pus appears suddenly in the urine after a certain continuance of the signs of suppuration. The former symptom indicates inflammation of the mucous membrane, the latter an abscess of the glandular substance, which has broken into the pelvis of the kidney. In either case, the patient may gradually recover, or the disease may continue long, even during the residue of life, in the chronic form. This is especially the case when calculous matter, or small concretions, are occasionally discharged with the purulent urine, proving the production of these substances in the kidney. The presence of pus in the urine may be known by the change which takes place with solution of potassa; the yellowish cream-like deposit becoming viscid and glairy, like ropy mucus, on its addition. When otherwise doubtful, it may be detected by means of the microscope.

Pus in the kidney may be disseminated, or in the form of an abscess in the glandular substance; or, it may exist in the pelvis, or in one of the distended calyces, in consequence of obliteration or obstruction of the ordinary outlet, either by coagulable lymph or calculous concretions. It has been already stated that the abscess sometimes breaks into the pelvis, and the pus is discharged with the urine. It sometimes also happens that the obstruction offered by a calculus in the ureter is partially or wholly removed, and pus and urine, often mingled with calculous matter, escape by the natural outlet. But, in both these cases, a different result sometimes occurs. The purulent collection goes on increasing, so as occasionally to produce large tumours, which can even be felt through the walls of the abdomen. This is especially the case with those which result from obstruction or obliteration of the ureter, and consequent distension of the pelvis of the kidney. In these, the pus is mixed with the secreted urine of which the escape is cut off, as well as with calculous deposition; and these collections sometimes attain an immense size, stretching out the substance of the kidney into a thin layer, and presenting evident fluctuation to an external examination. These abscesses or collections sometimes open into the peritoneal cavity, producing certain death. They have been known also to be evacuated through the colon, with a scarcely less fatal, though more protracted issue. Cases are on record, in which the matter has been discharged into the areolar tissue of the loins, and found its way outward through the skin; and, if the patient has resisted the first shock, pus, alone or mixed with urine and calculous matter, has long continued to escape through the fistulous opening. Even under such circumstances, recovery has taken place, though seldom. Another and much rarer outlet has been through the diaphragm into the lungs, with the expectoration of pus and urine, and ultimate death. It is asserted that a favourable issue has resulted, in some of these tumours, in consequence of a complete destruction of the substance of the gland, so that urine or pus was no longer produced, and an opportunity was offered for the removal of their contents by absorption, and for their consequent contraction and ultimate obliteration.

But suppuration is not the worst evil in acute nephritis. Sometimes a total suppression of urine takes place, with the occurrence of cerebral symptoms, as delirium, coma, and convulsions. In such cases, the urea and other principles usually thrown off by the kidneys accumulate in the blood, and act injuriously upon the brain. In other instances, the accompanying fever assumes a typhoid form, with dark-coloured, turbid, ammoniacal urine, which comes away involuntarily, and towards the close is blackish, or quite suppressed, while the breath and perspiration are fetid. Both these forms of the disease are almost always fatal. Again, gangrene sometimes though very rarely occurs, marked by a sudden cessation of pain, and universal collapse of the system. It necessarily ends in death.

Symptoms of Chronic Nephritis.—The conditions already described as occasionally following suppuration of the kidneys, may be considered as examples of a chronic form of the disease consequent on the acute. Occasionally the symptoms of acute nephritis gradually subside into those of a lower grade of inflammatory action, without previous suppuration; and the case becomes chronic. But the symptoms are sometimes also from the commencement those of the chronic form. There is little or no fever, and the pain in the lumbar region is slight, so much so occasionally as scarcely to be observed, unless the attention of the patient is directed towards it. Strong pressure usually aggravates it, or renders it sensible if not previously noticed. It does not, as in the acute form, extend to the groin or thigh, and there is no retraction of the testicle. The urine is diminished in amount, and passed more frequently than in health. It soon loses its natural acidity, becoming neutral or alkaline, assumes a turbid appearance, and deposits sediments consisting chiefly of the calcareous and ammoniaco-magnesian phosphates, sometimes mixed with urate of ammonia. Much stress is laid by Rayer on the alkalinity of the urine as a sign of inflammation of the organ. Should the disease advance, the pain increases, the urine sometimes assumes a purulent appearance, and a frequent pulse, night-sweats, and emaciation mark the development of hectic fever, under which the patient sinks if not relieved. When the urine remains free from pus, the inference is that the substance of the kidney is the exclusive seat of inflammation. But more frequently the pelvis is the part originally affected, or at least participates in the disease, and the urine, at first mucous, becomes purulent or muco-purulent in the end. In chronic, as in acute nephritis, the blood may become contaminated from the want of due purification by the kidneys; and various secondary affections may thus originate, which will be more particularly noticed under Bright's disease.

Diagnosis.—The complaints with which acute nephritis is most liable to be confounded are nephralgia, lumbago, inflammation of the psoas muscles, and partial peritonitis. In relation to most of these, it might be sufficient to say that they are without the scanty and disordered urine, the disposition to frequent micturition, the retraction of the testicle, and the pain shooting obliquely downward from the region of the kidney to the groin, which characterize nephritis. But nephralgia is sometimes attended with all these phenomena; and is to be distinguished only by the greater violence and more spasmodic character of the pain, and the total absence of fever. The pain in diseased psoas is situated somewhat as in nephritis, and the testicle is sometimes retracted; but the other symptoms above mentioned are wanting, as well as the gastric disturbance so common in the renal affection; and the increase of pain in the muscle, resulting from a voluntary movement of the thigh on the pelvis, is another diagnostic symptom. In lumbago, the pain is more superficial, and is greatly increased by certain motions, especially by attempting to rise from the sitting posture. In peritonitis there is vomiting; but the urinary symptoms and peculiar direction of the pain are absent, there is greater tenderness on pressure, the pulse is small and corded, and the expression of countenance peculiarly anxious. Chronic nephritis is liable to be confounded with inflammation of the bladder, which gives rise to the same mucous or purulent character of the urine; and the diagnosis is extremely difficult when the two affections, as sometimes happens, are coexistent; for the pains in the region of the kidney, if experienced at all, are apt to be overlooked in the more decided evidences presented of the disease of the bladder. In such cases, the lumbar uneasiness, detected upon a close examination, and the pain from pressure upon the kidney, will serve to indicate disease of the latter organ. Rayer considered alkalinity of the urine, which he believed never to attend pure cystitis, as a good diagnostic character; but, according to Dr. Golding Bird, this liquid may be alkaline, and loaded with phosphates, from disease limited to the bladder. In fistulous opening in the lumbar region, the urinous smell of the discharged matter will prove its connection with the kidney.

Dissection.—When death has taken place at an early stage, the kidney is found enlarged and congested, of a reddish-brown colour, especially in the cortical portion, with dispersed red points, and occasional spots of extravasated blood. It is sometimes four times as large as in its healthy state. The tissue is usually softened, though parts of it are said to be sometimes indurated, especially in the tubular portion. The mucous membrane of the pelvis is usually reddened and thickened, and the investing coat more easily separable than in the healthy state. At a later period, pus is observed in the glandular structure, either disseminated, or collected in small cavities, and sometimes also in the pelvis along with fibrinous exudation. In some rare instances, blood and pus have been seen interspersed through the broken-down tissue of the gland; the whole having a fetid odour, indicating gangrene. Sometimes the mucous membrane of the pelvis and calyces exhibits evidences of disease, without a corresponding affection of the parenchyma, being reddened, ecchymosed, and, in the advanced stages, softened, ulcerated, and even gangrenous. Occasionally patches of coagulable lymph exist upon the surface, which in some instances close the ureter. When obstruction of the ureter has occurred from fibrinous exudation, calculous concretion, or other cause, the pelvis is found to be distended with urine, mixed with blood, pus, and amorphous or crystalline deposits. In chronic cases, the kidney is sometimes larger, but usually rather smaller than natural, more or less hardened, often rough, granular, or lobulated on the surface, and of a pale colour mottled with red. In old cases of suppuration, the substance of the gland is mostly destroyed; the interior parts being reduced to a disorganized pasty mass, into which the remains of the blood-vessels and excretory tube may be seen to run in the form of fibrous cords. The mucous membrane is thickened, sometimes pale, at other times reddish-brown with slate-coloured patches, and occasionally ulcerated. When dilatation of the pelvis has taken place, pouches of great size are sometimes found, the walls of which consist partly of the thickened mucous membrane, partly of the distended substance of the kidney, the outer surface of which has formed adhesions with the neighbouring viscera. The contents of these pouches, when not opened by ulceration, consist usually of urine, pus, and blood, with occasionally one or more calculi, which have probably been the cause of the mischief. An instance is on record of a tumour of this kind weighing sixty-eight pounds. Instead of these large tumours, the fistulous passages are sometimes to be seen by which they have discharged their contents in the various directions already noticed.

Causes.—Mechanical violence, as from blows, falls, concussions, or penetrating wounds; exposure to cold and wet; the drinking of cold water when overheated and perspiring; various substances which have the property of irritating the kidneys, as cantharides both internally and externally used, oil of turpentine, and corrosive sublimate in poisonous doses; and the abuse of alcoholic drinks, have been enumerated among the causes of nephritis. Another very frequent, and perhaps the most frequent cause, is the presence of calculi, or gravelly matter in one of the calyces, in the pelvis, or in the ureter. In such cases, both kidneys are apt to be affected. These concretions produce inflammation in two ways, either by the direct irritation of their irregular surfaces, or by obstructing the outlet of the fluids and thus occasioning distension. In the former method, they are much aided by whatever produces in them sudden and violent movement, as horseback riding, jolting in a rough carriage, jumping, running, &c. Other substances in the kidneys besides calculi sometimes cause inflammation of the organ. Such are cysts, hydatids, and other morbid formations in the glandular tissue, including the tuberculous and carcinomatous. Still another cause, which is not unfrequently associated with the preceding, is gout. This sometimes operates by giving rise to the deposit of calculous or gravelly matter in the kidney; and sometimes by a direct influence, as where the disease has been translated from some other part. Gout not unfrequently constitutes a predisposition to nephritis, which is then brought on by cold, and excesses of various kinds. Other diseases serve as occasional causes. Any affection of the urinary organs capable of producing retention of urine may have this effect, in consequence of the distension of the pelvis of the kidney which results. Hence strictures of the ureter, morbid growths of the bladder closing the opening of the excretory duct into it, enlarged prostate, and affections of the spinal cord or brain producing paralysis of the urinary organs, may give rise to nephritis. It may occur also in consequence of the propagation of irritation from an inflamed portion of the urinary passages, whether the ureter, bladder, or urethra, to the pelvis of the kidney; and it is not improbable that the sympathy which connects an organ with the outer extremity of its excretory duct may act in this case, thus producing nephritis as a result of gonorrhœa, or other urethral inflammation. Various structures in contact with the kidneys are capable of imparting to them their own inflammation, as the enlarged liver and spleen, and the peritoneum. Nephritis sometimes occurs as an incident in the course of febrile diseases, especially those of a typhoid or malignant character. Certain persons seem predisposed to it by inheritance; probably through a tendency to gout or calculous complaints. Old age also gives a predisposition; for the disease is most common in declining life. It is more frequent in childhood than after puberty, or in full manhood.

Treatment.—In severe cases, in which there is reason to believe that the substance of the kidney is affected, and the pulse is vigorous, blood should be taken freely from the arm; and the bleeding should be repeated again and again, if the symptoms do not yield, and the strength of the patient permit. In many instances, however, especially of inflammation of the mucous membrane, such as results from uric acid gravel, for example, the grade of action is not sufficiently high to call for copious depletion. A moderate bleeding, or the application of cups to the loins, is all that is necessary; and sometimes even these may be dispensed with. It is, however, a good rule to take blood when the inflammation is sufficient to occasion fever, unless general weakness forbid the remedy. When the arterial excitement has been sufficiently subdued by the lancet, should decided symptoms of inflammation continue, local depletion by cups or leeches should be resorted to, and repeated if deemed advisable.

After the first bleeding, the bowels should be well evacuated. A loaded state of the colon must act very injuriously; and purging is moreover indicated both as a depletory and revulsive measure. As the stomach is often irritable, calomel is, perhaps, the best cathartic to begin with, being one of those most certainly retained. Should it not operate efficiently, it must be followed either by a mild purgative, as sulphate of magnesia or castor oil, or by copious enemata. When the pain is very acute, and especially if it be of a spasmodic character, opium should be given with the calomel, in doses large enough to make a decided impression. From one to three grains is not too large a dose in many instances; but perhaps the better plan would be to give a moderate dose both of the opium and calomel, and repeat it if necessary. Thus, from three to four grains of calomel and one of opium may be given every two hours, until three doses have been taken, unless relief is previously obtained. This combination often has the effect of composing the stomach, so that it will receive more kindly the saline or oleaginous cathartic, which, under these circumstances, should never be omitted. Should the system be rebellious to opium and its preparations, the extract of henbane may be substituted. Independently of their aid in cleansing the bowels, copious enemata of warm water or mucilaginous fluids, are thought to be useful as internal fomentations.

The bowels having been well evacuated, it will be advisable to aid the depletory measures by warm cataplasms or fomentations to the loins, the hip-bath, or the warm bath; care being taken that the patient is protected against cold. The warm bath is peculiarly applicable to children. At this stage, great advantage will also frequently accrue from opiate enemata at night. From forty to sixty drops of laudanum, in a wineglassful of mucilage or thin starch, thrown up the rectum, not only affords relief, but also frequently quiets the stomach, and enables it to receive medicines kindly. Should the stomach be retentive, instead of an anodyne enema at bedtime, a grain of opium, with an equal quantity of ipecacuanha, and a grain or two of calomel, may be substituted, and the bowels opened upon the following day by a mild cathartic.

To quiet irritation of stomach is often a prominent indication. Should it not yield to the anodyne, small doses of the effervescing draught, or repeated draughts of cold carbonic acid water, will frequently afford relief; and a sinapism may be applied to the epigastrium, should these remedies fail. Creasote has been recommended, but is of doubtful propriety, unless in the advanced stages.

When the stomach is retentive, free dilution by mucilaginous drinks, as gum arabic water, barley-water, flaxseed tea, &c., will often be useful by diluting the urine and rendering it less irritating. They are, however, peculiarly applicable to cases of mucous inflammation, without much disease of the substance of the kidney. In the declining stages, chicken, mutton, or veal water, or rennet-whey, may be substituted for the mucilages.

At any time, if the skin is hot and dry, citrate of potassa, in the form either of the neutral mixture or effervescing draught, will be found an excellent adjuvant; and tartar emetic, in very small doses, may be added if the stomach is not at all irritated.

When the disease is connected with calculous deposition, especially of uric acid or the urates, bicarbonate of soda is an invaluable remedy. If, therefore, the urine should deposit a lateritious sediment, or should be high-coloured, and prove strongly acid upon the application of test paper, let half a drachm of the bicarbonate be given three or four times a day, in three or four fluidounces of carbonic acid water, with or without syrup, care being taken to avoid the acidulous syrups. The same remedy is also useful, though less strikingly so, in the phosphatic depositions.

In gouty cases, in addition to the measures already proposed, attempts should be made to call the disease to the extremities by sinapisms to the legs or ankles, or bathing the feet in hot water, rendered more stimulating by red pepper or mustard. Colchicum is also an excellent adjuvant, given so as to keep up a moderate and steady influence on the secretions, without nauseating the stomach. It may often be usefully combined with morphia.

In the more advanced stages, benefit will accrue from irritation to the loins. Blisters are recommended by some, but they are hazardous from their tendency to produce strangury. Revulsion is more safely effected by ammoniacal lotions, sinapisms, pustulation with tartar emetic or croton oil, or by setons, issues, or even moxa. But these latter measures are best adapted to chronic cases.

Should the disease be of the chronic grade at the commencement, it will be proper to treat it at first by some of the remedies already enumerated, but employed with much more restraint. The occasional application of a few cups or leeches, possibly in some instances a moderate bleeding; attention to the state of the bowels and urine, which should be kept as nearly normal as possible (see *Calculous Disease*); revulsive applications to the loins; the wearing of flannel next the skin; and a careful avoidance of the exciting causes, are the most important measures. But, when the disease is advanced, whether originally chronic or consequent upon an acute attack, and the urine is loaded with mucus or pus, indicating disease and possibly ulceration of the pelvis of the kidney, another system of measures becomes necessary. Attempts should now be made to act directly upon the diseased surface by medicines which pass through the kidneys. Among these uva ursi has long been prominent, and should be employed freely in the form of decoction. Pipsissewa has analogous properties, and is probably not less efficient. The turpentines and balsams have long been employed in these cases with obvious benefit. Oil of turpentine and copaiba are the most convenient, and probably the most effectual. Even cantharides may be here employed, as a stimulant impression upon the diseased surface is often highly useful; but great caution should be observed in its use. Buchu and pareira brava have enjoyed much credit in this stage of the disease. Should any of these remedies produce much irritation, they should be suspended, and recourse be had to demulcent and emollient measures. In the mean time, it is necessary to support the general health. For this purpose, some of the milder tonics may be occasionally used with advantage, especially the chalybeates and pure bitters. Wild-cherry bark is well adapted to cases complicated with hectic fever. Moderate exercise and pure air are highly important. If a resident of cities, the patient should, therefore, be sent into the country during the summer. Certain mineral waters have been found beneficial, especially those combining a chalybeate with alkaline salts and carbonic acid impregnation.

The diet should be adapted to the stage and grade of action. In the early stage of the acute disease, it should be exclusively mucilaginous or farinaceous, and should be employed usually in the liquid form. When the disease is advanced, weak animal broths may be added; and, in cases of debility with a tolerably sound state of the digestive function, a full allowance of the ordinary food may be permitted; indigestible and acescent substances being scrupulously excluded. In the chronic disease, with symptoms of local or general excitement, it is best to restrict the patient to vegetable food, with the addition of milk in doubtful cases. But, when suppuration is established, and the general strength fails, the diet should be nutritious, though still mild and digestible.

When coma supervenes upon affections of the kidneys, little additional can be done. The attention of the physician is still to be directed to the disease of the urinary organs; and the restoration of the suspended secretion should be the object chiefly aimed at; as it is upon this probably that the cerebral symptoms depend. When the kidneys are actively congested, the hot air-bath or the vapour-bath is very effectual. The stimulating diuretics, in this condition, can do only harm. The cerebral symptoms may be combated by cold to the head and leeches to the nape of the neck or the temples. Typhoid cases must be treated upon the principles applicable to low forms of fever in general.

In all cases where the symptoms do not appear disposed to yield, and the remedy is not prohibited by a cachectic state of system, mercury, so exhibited as but slightly to touch the gums, promises some chance of good.

Article II.

BRIGHT'S DISEASE, OR RENAL CACHEXIA.

Syn.—*Granular Degeneration of the Kidneys.—Fatty Degeneration of the Kidneys.—Desquamative Inflammation of the Kidneys.—Albuminuria.—Albuminous Nephritis.*

ATTENTION was first called by Dr. Bright, of London, to the peculiar association of symptoms, connected with a disordered state of the kidneys, which, for the want of a name fitted to express its precise pathological character, is generally called Bright's disease, in honour of its original observer. This name it will be most convenient to retain, until opinion shall have become settled upon the exact nature of the affection. In the course of the following observations, it will be rendered obvious that neither of the names, given above as synonymes, has a just claim to exclusive adoption. In proposing the title of *renal cachexia*, I have been influenced by the considerations that, so far as the disease can be considered as a unit, it is properly an affection of the blood, that this is attended with a depraved state of the system such as usually comes under the designation of cachectic, and that the general morbid condition depends on deranged function of the kidneys. At one time it was supposed that the renal disease was of one special character, and that all the variations, observed in the structure and functions of the organ, were merely differences in the degree or stage of that disease. But subsequent observations, especially those of Dr. George Johnson, of London, have, I think, satisfactorily shown that morbid affections of the kidneys exist in Bright's disease, which are entirely different, in some instances even opposite in their nature, so that no name founded exclusively on the renal affection could be universally or even generally applicable. But all the organic disorders of the kidneys connected with the disease have this in common, that they incapacitate the organ for its office of depurating the blood of its effete matters, while they admit of the escape of its albumen or fibrin or both, which are healthful ingredients. The blood thus becomes diseased by the retention of substances which the kidneys ought but are unable to eliminate, and by the loss of others which in their healthy state they do not allow to pass. This condition of the circulating fluid, with its various effects on the system, is the proper disease; and I know of no more appropriate position for it than among the cachexiæ; while by the epithet renal its origin in disorder of the kidneys is sufficiently expressed. *Uræmia* might by some be thought a more appropriate name, as it expresses the admitted fact, that urea is in all cases of the disease accumulated in the blood; but it is not sufficiently comprehensive; for other effete principles are accumulated besides urea; it is by no means certain that this substance is the main noxious agent; and the character of the blood is affected as well by what it morbidly loses, through the kidneys, as by what it morbidly retains. Uræmia cannot, therefore, I think, be admitted as signifying what is meant by Bright's disease, nor received as a substitute for that name.

The statements put forth by Dr. Bright, in 1827, were afterwards confirmed and extended by other observers, among whom Drs. Christison, Gregory, and Osborne, of Great Britain, and MM. Solon and Rayer, of France, were the most prominent; and more recently many valuable microscopic observations have been contributed by Professor Gluge, of Brussels, Dr. George Johnson, of London, and several others. It is due to Dr. Christison to state that, in drawing up the following account of the disease, I availed myself of his lucid essays on the subject.

There are two forms of the disease, which are sometimes distinct in their origin and course, sometimes appear to be merely different stages of the same at-complaint resume its chronic march. At length other diseases supervene, and either carry off the patient, or leave him, upon their subsidence, more exhausted than before. The system seems to be peculiarly susceptible to inflammatory attacks, whether acute or chronic, such as pleurisy, peritonitis, pericarditis, bronchitis, and pneumonia. Derangement of the alimentary canal is not uncommon. Frequent and very obstinate vomiting is a prominent symptom in this stage. Though generally constipated, the bowels are sometimes affected with an exhausting diarrhœa; and dysentery, very violent and even fatal, is another occasional complication. Organic diseases of the heart, lungs, and liver, either previously existing, or developed during the progress of the complaint, very often aggravate the danger, and render a fatal termination almost certain. In the ordinary course of the complaint, if it end unfavourably, death is preceded by comatose symptoms, sometimes amounting to apoplexy.

The urine differs greatly in different cases, and at different periods of the same case. The only invariable circumstance in relation to it is a reduction of its specific gravity, owing to the diminished proportion of its solid constituents, especially the urea and salts. This is the most characteristic phenomenon of the chronic form of the complaint. Though the density of the urine is generally somewhat below the healthy average in acute attacks, the reduction is trivial compared with that which takes place in the chronic. According to Prout, the specific gravity of healthy urine is from 1·015 to 1·025, according to Solon, from 1·020 to 1·024. It has been diminished in this complaint to 1·003, though the average is considerably higher than this. The density goes on diminishing with the progress of the complaint, and is not materially increased by the supervention of an acute attack.

The urine is very generally, though not uniformly albuminous; and the quantity of albumen varies. It is always much less than in the acute disease, except when an acute attack supervenes upon the chronic. The coagulum produced by heat or nitric acid, instead of occupying one-third of the volume of the urine, below which it seldom falls in the acute, is diminished to a quarter or even an eighth. In the advanced stages, it sometimes wholly disappears for a time, and sometimes the usual tests occasion only a slight opalescence. Towards the close of the case, this may happen even though the urine is but small in quantity; but it also sometimes occurs at an earlier period, when the secretion is more than ordinarily copious.*

The quantity of urine is also very variable. Sometimes it is very small, sometimes natural, sometimes increased; and the augmentation is occasionally so great as to constitute diuresis. It diminishes upon an acute invasion, and near the close of the complaint, when the daily discharge is often reduced to one or two ounces. The colour of the urine may be yellowish, or blood-red, or dark-brown, or even quite natural; but it is usually much paler than in health, and the secretion is in some instances almost colourless. It is generally more or less turbid or opalescent, from the same cause as in the acute form. The fleecy matter which communicates the partial opacity, gradually settles towards the bottom of the vessel, without in all instances completely separating. In microscopic examinations, therefore, the lower portion should be selected where there is no solid sediment. In this insoluble matter are found, in various proportions, and on different occasions, blood or pus corpuscles, oil globules, epithelial cells variously altered, cylindrical casts of the uriniferous tubules, and occasionally the urates and phosphates.

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* Dr. G. Owen Rees has generally found one of the extractive matters of the blood in these cases, along with the albumen. After separating all the albumen by brisk boiling and filtration, so that the urine yields no sign of the presence of this fluid, he has been able to obtain a copious precipitate with tincture of galls, showing a strong analogy between the liquid eliminated by the kidneys, in these cases, and the effusions from serous surfaces. He has noticed the same extractive matter in the urine of cardiac anasarca without disease of the kidneys, and in chlorotic anæmia, and believes that its escape from the blood contributes much towards the impoverishment of that fluid, and the production of debility in such affections. It diminishes along with the albumen in convalescence. (*Lond. Med. Gaz.*, July, 1851, p. 136.)—*Note to the third edition.*

A singular circumstance, considered in connection with the state of the urine, is the rapid diminution of the red corpuscles of the blood. It has been stated that, in the acute stage, the proportion of this constituent is but slightly changed, while the serum of the blood loses much of its albumen, in consequence of the rapid separation of this principle by the kidneys. But as, in the chronic stage, less albumen is discharged with the urine, the serum nearly reacquires the proportion which it has in health. The salts and fibrin of the blood are not materially changed in quantity; and urea, which is scarcely appreciable in health, has often been found in the serum in Bright's disease; an event which might be looked for from the diminished amount secreted. All this is what might be expected from the condition of the urine. But the disappearance of the colouring matter of the blood is not so readily accounted for. All due allowances being made for the effects of artificial bleeding, and of occasional hemorrhage from the kidneys, the red corpuscles are sometimes reduced to one-third of their healthy proportion under the direct influence of the disease alone. The diminution goes on until the close of life; and the whole surface of the body consequently often acquires before death a waxen, yellowish-white, almost cadaveric hue. To what is this loss of the red corpuscles to be ascribed? Is it owing to the failure of the digestive process? In reply to this question, it is asserted that the phenomenon occurs in cases in which the digestion is apparently unimpaired. Can it be that the colouring matter is changed into albumen by the kidneys? This is not probable. The fact that the proportion of albumen in the urine is smallest in the advanced stage, when the decolorization of the blood is going on most rapidly, is wholly incompatible with this notion. The most probable explanation appears to be, that there is some failure in the vigour of the assimilating processes, dependent either on the same cause which has predisposed the kidneys to the morbid change going on within them, or on the depraved character of the blood, unfitting it for the support of these processes. It has been suggested that the effect might depend on a solvent power of the urea over the red corpuscles, or a poisonous influence leading to their destruction; and the same influence may be ascribed to other effete matters retained in the blood by the defect of renal elimination.

Associated Disorders.—Dropsy is the most frequent and important of the affections associated with Bright's disease. It has, indeed, been considered as one of its essential phenomena. But this is an error. It is not only often absent during long periods in the progress of the disease, but is sometimes wanting throughout its whole course, especially in the acute form. Nor are all cases of dropsy with albuminous urine, as has been supposed by some, associated with this particular disease of the kidneys. But when along with dropsy, in any particular case, there is scanty and highly albuminous urine, and when the specific gravity of that secretion is decidedly and steadily below that of health, at the same time that the quantity is at times at least reduced below the natural standard, and especially if there is evidence in lumbar pains of the existence of renal disease, there is no longer room for doubt. The dropsy has been ascribed, in acute cases, to the diminution of albumen in the blood, and, in chronic cases, to this combined with deficiency of red corpuscles, whereby the liquid portions of the blood are allowed more readily to pass through the vascular walls. There is probably some truth in this supposition; but it appears to me that, in the acute form, it comes on too speedily after the first evidence of kidney affection, to be ascribable, at least exclusively, to any change in the constitution of the blood dependent on that affection. In such cases, a more probable origin is either irritation of the serous or areolar tissue, re-complaint resume its chronic march. At length other diseases supervene, and either carry off the patient, or leave him, upon their subsidence, more exhausted than before. The system seems to be peculiarly susceptible to inflammatory attacks, whether acute or chronic, such as pleurisy, peritonitis, pericarditis, bronchitis, and pneumonia. Derangement of the alimentary canal is not uncommon. Frequent and very obstinate vomiting is a prominent symptom in this stage. Though generally constipated, the bowels are sometimes affected with an exhausting diarrhœa; and dysentery, very violent and even fatal, is another occasional complication. Organic diseases of the heart, lungs, and liver, either previously existing, or developed during the progress of the complaint, very often aggravate the danger, and render a fatal termination almost certain. In the ordinary course of the complaint, if it end unfavourably, death is preceded by comatose symptoms, sometimes amounting to apoplexy.

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Bright's disease is characterized by a strong tendency to the development of inflammation in other parts of the body, especially the serous membranes. The pleura, peritoneum, and pericardium are attacked, in relation to frequency, in the order in which they are here placed; and the arachnoid is sometimes affected. Bronchitis is not unfrequent, and is apt to be very obstinate. Pneumonia has also been noticed in some cases. Chronic rheumatism is said to be very frequent and obstinate in the chronic disease of the kidneys; and, according to Dr. Goodfellow, the affection strongly predisposes to erysipelas. These inflammations are liable to occur upon slight exposure to cold, or to cold and wet combined; and may be ascribed to the condition of the blood, rendered impure by the defective state of the most important emunctory. The reparative powers of the system, in cases of wounds or other injuries, are said to be impaired, probably from the same cause.

Aphonia has been noticed as an occasional attendant of Bright's disease, sometimes, as shown by the laryngoscope, dependent on œdema of the glottis, but sometimes also, probably, arising from other causes, as laryngitis, &c.

Cardiac and hepatic diseases are very frequent associates of Bright's malady. Out of one hundred cases recorded by Dr. Bright himself, there were only twenty-seven in which no cardiac affection could be detected, and in fifty-two instances the heart was in a state of hypertrophy. In eighteen of these there was valvular disease, in eleven the aorta was affected, and, in the remaining twenty-three, the hypertrophy could not be traced to any other organic affection of the heart or the large blood-vessels. (See *Watson's Lect.*, Am. ed., p. 785.) The inference is obvious that, where the disease originated in the course of the renal affection, it must have been owing to the existing anæmia, which, by an obvious mode of action, is one of the most powerful agents in the production of hypertrophy and dilatation of the heart. But not unfrequently the cardiac precedes the renal disease; and it is not at all unlikely that the two have one common cause. The same may be said of the disease of the liver, which occasionally accompanies Bright's disease, and very greatly increases its danger. The most frequent hepatic affections under these circumstances are fatty degeneration, and that usually denominated cirrhosis. The affections both of the heart and liver tend very strongly to increase the dropsical effusion, which is supposed to have its origin in the renal disease.

Dyspeptic symptoms are extremely common, and often very troublesome. Dr. Christison lays great stress on the chronic vomiting frequently attendant upon the complaint of the kidney, and apt to be peculiarly distressing towards its close. It sometimes occurs daily upon the awakening of the patient in the morning, sometimes often in the course of the day; and in some cases all the food taken into the stomach is rejected. It is highly probable that the cardiac disease has some influence, perhaps the chief influence in producing this state of the stomach. So far as regards the latter organ, it appears to be merely functional. The inference is obvious, that it must greatly contribute to exhaust the patient, and hasten the fatal issue. The frequent attacks of diarrhœa and those less frequent of dysentery, incident to the disease, have been before alluded to. Sometimes the diarrhœa is useful by relieving the dropsy, sometimes it is the immediate cause of death by the exhaustion it produces. It may in some instances be purely functional; but is more frequently dependent on chronic inflammation and ulceration of the bowels.

In this catalogue of associated affections, the cerebral must not be overlooked. They are indeed of very great significance; as it is through the brain that a fatal issue of the disease very frequently takes place. Coma may, indeed, be considered as the regular termination of a fatal case of Bright's malady. In some acute cases, it is the immediate consequence of a total suppression of the urine; and the patient is carried off without the supervention of dropsy, or any other secondary affection. When dropsy is developed, comatose symptoms frequently make their appearance, and are always a signal of danger. In chronic cases, one of the most characteristic phenomena is occasional drowsiness, sometimes disappearing and again recurring, but on the whole gradually deepening as the complaint advances, until at length it sinks into profound coma shortly before death. In some instances, the brain shows evidences of more active disorder, in the occurrence of apoplexy, convulsions, or delirium. Amaurosis has repeatedly been noticed as an associate of Bright's disease, and violent headaches are another occasional attendant. The impairment or loss of vision appears to be in some instances owing to an alteration of the retina; and white patches, as if from fibrinous or albuminous deposit, have been observed in that membrane, by the aid of the ophthalmoscope. A rapid increase of presbyopia sometimes marks the occurrence of the affection. Puerperal convulsions and puerperal insanity have occurred in connection with the disease; so that albumen in the urine in the pregnant state is calculated to excite solicitude. It is customary to ascribe the drowsiness, coma, and other cerebral phenomena to the accumulation of urea in the blood. In all probability, either this, or other impurities remaining in the circulation from the closure of their usual outlet, are the cause of the symptoms by directly poisoning the brain. It is a frequent observation that the drowsiness is increased when the urine becomes very scanty, and is relieved by an increase of the renal secretion. Total suppression of the urine is almost constantly followed by coma. In opposition to these views, it may be urged that urea is in all cases defectively eliminated, and if it be the cause of coma in one instance, it should be so universally. But the objection is met by the fact, that this and other noxious principles escape with the dropsical fluid, in which, in fact, urea is asserted to have been rendered evident by chemical tests. Thus, the occurrence of dropsy may be considered as in some degree a safeguard. According to Frerichs, whenever these cerebral symptoms are exhibited, the blood will be found to contain not urea only, but also carbonate of ammonia, which is supposed to result from the decomposition of the former principle, and is conjectured to be the immediate cause of the morbid phenomena. Frerichs supposes that, for the decomposition of the urea, some agent must be present in the blood capable of acting on this principle as a ferment, and, according as such an agent is present or absent, there will or will not be produced the poisonous effects ascribed to urea. But the opinion that urea is converted into carbonate of ammonia in the blood, has been rendered very improbable, if not quite disproved by the experiments of Dr. W. A. Hammond, of the U. S. Army. (*N. Am. Med-chirurg. Rev.*, March, 1858, p. 293.) Experiments by the same author have satisfactorily shown that urea injected into the circulation is capable of producing phenomena analogous to those of renal cachexia; but they also show that other retained principles produce the same effect; as urine injected proved to be more poisonous than urea alone. (*Am. Journ. of Med. Sci.*, Jan. 1861, p. 82.) But there are probably also other sources of the coma. Sometimes it increases with the increase of the dropsy, and diminishes with its diminution. In such cases, it probably depends upon the effusion of serum into the ventricles, and is relieved by the absorption of that fluid. The anemic state of the blood may possibly also occasion drowsiness, from the want of the stimulating properties requisite to keep the brain in action. Again, the cerebral symptoms are probably owing, in some instances, to sanguineous congestion of the brain, or meningeal inflammation, consequent upon the same state of system which occasions inflammation elsewhere; and it can scarcely be doubted, that this organ participates not unfrequently in that tendency to fatty or other degeneration, which affects so many other organs, and is often indeed the primary cause of the affection of the kidney itself.

Course of the Disease.—When the acute cases are about to terminate favourably, which they often do after an uncertain duration, the lumbar pains cease, the urine increases greatly in quantity, and the dropsical symptoms with the tendency to drowsiness gradually diminish, until health appears to be restored. Should the urine continue to be albuminous, the apparent recovery must be looked on as delusive, and the practitioner should persevere in his curative measures, or be prepared to encounter a return of the symptoms. In unfavourable cases, the disease runs a variable course. Sometimes, without dropsical symptoms, a comatose or apoplectic state comes on speedily, and after a few days carries off the patient. This is apt to happen when the urine is exceedingly scanty, or altogether suppressed. In some instances, the coma is the first symptom which causes alarm; the local affection of the kidney having escaped attention, and being, perhaps, first discovered upon examination after death. Much more frequently dropsy takes place, either extensively anasarcous, or involving also the serous cavities; and the patient perishes of some intercurrent inflammation, or dies comatose in the ordinary progress of the complaint, or, after partial and temporary ameliorations, falls at length into the chronic state of the disorder.

The usual course of a chronic case in its earlier stages has already been described. In this form, the disease, when once established, either runs slowly onward with a steady aggravation of the symptoms, or undergoes various changes from the occurrence of secondary diseases, the occasional supervention of acute attacks of the renal affection, and from remissions or ameliorations from natural causes, or under the influence of treatment, with subsequent exacerbations. Sometimes the complaint appears to be quiescent for a considerable time. The dropsy yields wholly or in part, the intercurrent inflammations are relieved, and the patient is apparently well; but fresh exposures bring on renewed attacks, or the local affection, which has remained quiescent, becomes again active, and the complaint resumes its march with an accelerated pace. Should the patient not perish with an acute or chronic inflammation, or in one of the supervening attacks of the disease in the acute form, he becomes weaker and weaker, more and more anemic, more and more dropsical, and at length sinks into a fatal coma, or perishes of the complications incident to dropsy in its last stage; incurable organic affections of the heart or liver not unfrequently superadding their influence to that of the renal disease. It has been said that apparently favourable changes take place under remedies, which promise fairly, but not unfrequently deceive the hopes of the practitioner. Such indications are never to be relied on, unless the urine resumes and retains the healthy character. It must not only become natural in appearance and quantity, and free from albumen; these changes not unfrequently occur without any real improvement; it must also regain the healthy density, showing that the kidneys are capable of performing their part in the purification of the blood; and the favourable change must persist for a long time, before it will justify confidence in the sound condition of the kidneys.

Anatomical Characters and Varieties.—The various diseased conditions found in other parts besides the kidneys may be left out of consideration here, as they are simply attendants or effects of the disease, and are sufficiently noticed elsewhere. The characteristic lesions of Bright's disease are in the kidneys. As before stated, however, these organs do not exhibit exclusively any one peculiar or special lesion. They have been found to be variously affected; presenting in the acute form of the disease evidences of active congestion or inflammation, in chronic forms, various organic derangements, which will be severally noticed.

In the early stage of the acute form, the kidney is found greatly congested and enlarged, weighing twice, thrice, or even four times as much as in health. It is also flabby and soft, though the softness is stated to be different from that ordinarily produced by inflammation. Signs of vascular congestion are also presented in visible arterial ramifications, and reddish points upon its outer and inner surfaces. The colour externally is dark, with spots here and there still darker. Internally, the organ appears engorged with blood, and exhibits small patches of ecchymosis. The cortical part, which is chiefly and sometimes exclusively affected, is of twice or thrice its ordinary thickness. These phenomena might be considered as those merely of the early or congestive stage of ordinary acute nephritis; but another circumstance, which constitutes the peculiarity of the case, is that, in the midst of this congested parenchyma, there is often an apparent granular formation, which, though in this stage of the same colour as the neighbouring structure, is proved to be distinct by the fact, that it is impervious to the finest injection, which therefore surrounds and defines it. The quantity of this matter appears to increase with the progress of the disease, and is abundant in cases which have continued several weeks.

In the chronic form of the disease, the kidney may be found enlarged and flabby, or of the natural size, or more or less contracted, with the capsule usually in some degree adherent. When enlarged or of full size, the outer surface is paler than in health, mottled with yellowish or grayish patches, with more or less pink, and either uniform, or more rarely somewhat irregular and nodulated. The cortical portion is relatively much thicker than the other parts, and internally has the same yellowish marbled aspect, the natural striæ being obliterated or deranged. In a more advanced stage, the whole cortical portion, including that which dips between the pyramids, has lost its natural reddish-brown colour, and assumed a yellowish hue, which is the more striking from its contrast with the healthy colour of the pyramidal structure, which may be little affected; but at length even this is to a greater or less extent invaded, and may be in great measure obliterated. If a minute examination be made, small granulations will be often observed, whitish or yellowish, and about as large as the head of a pin, scattered through the substance or on the surface of the cortical part, and sometimes clustering so as to appear like patches. Sometimes, however, the new matter is quite homogeneous over considerable spaces; and, in some rare instances, the whole interior of the kidney, except portions of the pyramids, presents a uniform yellowish colour. The outer surface, as well as the cut surface of the cortical portion, often has a rough or granular feel.

In another condition of the kidney, whether original, or indicating a more advanced stage of the disease, the surface, while it has the same mottled appearance, is irregular, often tuberculated, probably from the unequal absorption of the healthy tissue, and the consequent shrinking of the surface. The whole kidney is often greatly shrunk, and sometimes very hard; and internally there are few remains of the healthy striated cortical portion, which seems like a slender layer beneath the capsule. The pyramids also are shrunk and deranged in position; and, in some very old cases, the whole kidney has been reduced to a shrivelled, flabby, almost membranous structure, in which little or nothing remains either of the proper glandular parenchyma, or of any abnormal deposit.

In some instances of the contracted kidney, presenting a more or less irregular surface, the cortical structure is replaced partially or wholly by firm, white, elastic, fibroid tissue, which, after usurping the place of the healthy structure, appears itself to have undergone an irregular contraction, and thus to have lessened the dimensions of the organ. This I have myself seen in a case of chronic Bright's disease, in which there was albuminous urine of diminished specific gravity, with general dropsy, and other symptoms of the worst forms of the complaint.

Occasionally suppuration has been noticed in the kidneys; and small cysts are not unfrequently found on the surface or in the substance of the organ, which are sometimes very numerous, and are ascribed by Dr. Johnson to distension of the tubules produced by obstruction below the points of dilatation.

A case has been recorded by Dr. W. R. Barham, in which, after death with the characteristic symptoms of Bright's disease, the tubules were found unaffected; the whole disease consisting of inflammation followed by suppuration outside of the tubules. The urine in this case had been purulent, and without tube-casts, though of course albuminous. (*Lancet*, April, 1859, p. 359.)

Tuberculous deposit is another condition which has been found attending upon Bright's disease. The supra-renal gland is usually hardened.

It was only with the aid of the microscope, that any hope could be entertained of ascertaining the precise nature of those changes in the kidneys, upon which the appearance offered to the unaided senses, as well as the consequences of the nephritic disease, depend. Such researches have been diligently made; and the result has been the discovery of several affections of the kidneys, wholly distinct in their nature, though sometimes associated, which constitute the real organic lesions in Bright's disease, in at least a great majority of cases. The most frequent of these affections are 1. an inflammation affecting especially the uriniferous tubules, and called by Dr. Geo. Johnson *desquamative inflammation of the kidneys*, 2. *fatty degeneration*, consisting mainly in a great excess of oil in the epithelial cells of the tubules, 3. *waxy*, *albuminoid*, or *amyloid degeneration*, and 4. *atrophy of the kidneys*, in which the epithelial lining of the secretory tubules is lost in a greater or less degree, and the whole organ shrinks; the *cirrhosed kidney*, or *fibroid degeneration* being included under this head.

Desquamative Inflammation.—This is the distinctive character of the acute febrile cases of the disease.* It occupies at first the cortical portion, and is believed to be seated especially in the uriniferous tubules, though producing the general congestion of the kidneys which has been noticed in the acute disease. One of the effects of the inflammation is to cause a more or less rapid production and separation of the epithelial cells, while at the same time fibrin is exuded so as to form a pseudomembranous lining to the tubules, and the ordinary products of the secretion are greatly diminished or cease to appear. The accumulation of the exfoliated cells and exuded fibrin produces distension of the tubules, which are thus made to compress the vascular rete around them, and consequently to produce congestion of the Malpighian corpuscles, which in this condition throw out serum and sometimes blood itself, but less water than in health. The fluid extravasated from the Malpighian bodies washes down the contents of the tubules, and together with these passes out of the body as urine. This, therefore, while it may hold little urea or saline matter in solution, must be more or less albuminous, and contain epithelial cells, fibrinous casts of the tubules, and not unfrequently blood.

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* In order to understand this subject, it is necessary that the student should have an idea of the intimate structure of the kidney as recently made known. The cortical portion of the gland consists, in great part, of a congeries of tortuous, uriniferous tubules, which, on leaving this structure, become straight, and combine to form the cones which project into the renal pelvis. These tubes, both in their tortuous and straight course, are lined with epithelial cells, which, in the former, are believed to be the agents of the true urinary secretion, separating the urea, uric acid, saline matters, and other characteristic constituents of the urine from the blood. Here and there in the cortical tubules, as ascertained by Mr. Bowman, or at the end of each tubule, as stated by Frerichs, an expansion may be observed, in which is admitted one of the Malpighian corpuscles, invested by a very delicate epithelial coating, which separates it from the cavity of the tubule. These little bodies are formed by the convolutions or ramifications of a branch of the renal artery, terminating in a vein, which leaves the corpuscle where the artery enters, and then itself ramifies so as to form a network of vessels about the neighbouring tubules. The office of the Malpighian bodies is believed to be to separate from the blood its watery and perhaps saline parts, which, passing down through the tubules, wash away the characteristic urinary matters eliminated by the cells, and, mixing with or dissolving them, form urine. The cells are believed to derive the materials of their secretion from the blood of the venous network by which they are surrounded. Other tortuous tubules, named the *tubules of Henle*, because minutely investigated and described by him, are now admitted to enter into the constitution of the cortical part of the kidneys and the pyramids; but, as they are not known to participate in the function of secretion, or to be otherwise specially concerned in Bright's disease, it is not worth while to notice them further here. (See *Arch. Gén.*, Fév. 1865, p. 176.)

Fatty Degeneration.—In this condition, which was first investigated by Gluge, and afterwards independently by Johnson, oil globules are deposited in great excess in the epithelial cells, distending them, and causing their detachment from the walls of the tubules, which become at points so much dilated as to burst, and allow the escape of the fatty cells into the neighbouring tissue. Similar effects are produced in this as in the preceding case upon the proper secretion, and, by pressure, on the blood-vessels and the Malpighian corpuscles. In the urine the main difference is that, instead of the ordinary epithelial cells and fibrinous casts of the tubules, we observe detached cells loaded with oil globules, casts of the tubules containing the oil-bearing cells embedded in them, and oil globules scattered separately over the field of the microscope. In the cases of simple fatty degeneration, the kidney is in the beginning enlarged, yellowish, smooth, and less opaque than in the inflammatory form; and the capsule is easily removed.

In some cases, the two affections are combined, the desquamative inflammation coexisting with the fatty degeneration; and in such the urine will contain cells and casts with and without the oil. The presence of a few oil globules in the epithelial cells is said by Frerichs to be normal; but Dr. Gairdner maintains that the least trace of oil indicates a diseased state of the kidney, and Dr. Geo. Johnson, who anticipated Frerichs in his statement, has subsequently been induced to change his opinion on this point.* The coincidence of inflammation and fatty degeneration is in no degree extraordinary; for the fibrin exuded in the former state may, as the powers of the part fail, undergo a change into oil; and, as suppuration is seldom observed in this affection, it seems highly probable that the fatty degeneration may be substituted for it; the two conditions having this in common, that they originate under similar conditions of the vital forces.

Some maintain that the fatty kidney is uniformly the result of the previously inflamed organ; but of this there is no proof whatever, either in the symptoms during life or the appearance after death; and analogy is altogether opposed to the assumption; as, fatty disorganization without antecedent inflammation being very common in other organs, there is no reason why, under similar influences, it should not take place in the kidneys also.

The characteristic appearances of the kidneys may be readily accounted for upon the basis of the above facts. In both forms, the kidneys may be at first increased in bulk, in the one from general congestion and exudation of fibrinous matter in the tubules, in the other from the copious production of oil. In both, the granular consistence may be given by the aggregation into small masses of the separated epithelial cells. In the fatty kidney, the colour, whether uniformly yellow or mottled, is owing to the fatty matter, which in the former case is uniformly diffused, in the latter is in isolated spots. The shrinking of the gland, in the progress of the disease, is what might be anticipated. Pressure on the blood-vessels causes their obliteration; the Malpighian bodies, not receiving blood, wither; and, as the deposition producing the atrophy is irregularly distributed, the shrinking is also irregular, giving a granular, tuberculated, or lobulated character to the surface. As the uriniferous tubules are deprived of their cells, the denuded basement membrane becomes wholly incapable of performing the proper function of secretion, though it may permit the watery portion of the blood to pass more or less albuminous, so that, in the advanced stages of the disease, there may be a considerable quantity of watery urine, with or without albumen. The function of the kidney being thus impaired, the atrophy continues to increase from this cause; till at length the gland may become completely wasted.

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* See *Brit. and For. Medico-chirurg. Rev.* (Am. ed., April, 1852, p. 219); also *Lond. Med. Times and Gaz.* (iv. 283).

Waxy Degeneration.—This condition of the kidney is much more common than it was formerly thought to be. Dr. T. Grainger Stewart, of Edinburgh, states that of 84 cases occurring in that city, 26 were of this kind. (*B. & F. Medico-chir. Rev.*, Oct. 1865, p. 430.) In this form of the disease, the kidney is much enlarged and increased in density, in consequence of the deposition of a lardaceous or waxy-looking matter (amyloid matter of Virchow), which imparts to the organ a characteristic paleness and transparency, and is distinguished by its peculiar chemical reactions, giving a brownish-red colour with iodine, a purplish-red or more rarely a blue colour with iodine and sulphuric acid, and a bright-yellow with chromic acid. Dr. Stewart, who has thoroughly investigated this variety of Bright's disease, gives the following as characteristic features. He distinguishes three stages. In the *first*, the kidney is of the normal size; but the Malpighian bodies are somewhat more distinct, and the cut surface glistens with minute scattered spots resembling the granules of sago. The waxy matter forms first in the capillary tufts of the Malpighian corpuscles, and in the circular fibres of the small arteries, which appear under the microscope circularly wrinkled, like the roots of ipecacuanha. The affection spreads till these bodies and all the smaller arteries become degenerated, and the cut surface, under the action of a solution of iodine, looks like a fine injection. At this stage the tubules are natural. In the *second stage*, the bulk and weight of the kidney have increased, the capsule is easily separated, and the surface is smooth and pale. The cortical part, which has increased relatively more than the rest, has a waxy appearance, and is studded with small translucent points, which are the altered Malpighian bodies. The cones are pink-coloured, and of the normal size. Upon microscopic examination, many of the tubules appear full of matter, somewhat translucent, but less so than the Malpighian corpuscles and the vessels, and do not show the characteristic reaction with iodine. The cells are usually fatty. The enlargement is probably owing chiefly to a distension of the tubules with a fibrinous exudation, which coagulates. In the *third stage*, the organ is in an atrophic condition, being reduced both in bulk and weight; the surface is uneven; and the colour is pale, though occasionally mottled with a sebaceous-looking material. On section, the cortical part is seen to be much shrunken, while the cones are little changed. The Malpighian bodies are large and closely grouped, the smaller arteries dilated with thickened walls; and the tubular structure mostly wanting. The degree of atrophy varies from somewhat less than the natural size to one-sixth of it, or even a smaller proportion. The period occupied in these changes is long, sometimes exceeding five or six years. (*Ibid.*, p 432.)

Atrophy.—Desquamative Disease of the Kidney (Geo. Johnson).—*Gouty Kidney* (Todd).—*Cirrhosed Kidney.*—All the three preceding varieties, though in their course characterized by enlargement of the kidney, appear to have this in common, that, if they continue long, the kidney diminishes in size, and at length becomes, in some cases, very greatly atrophied. But there are instances of the disease, in which the atrophic tendency shows itself at the commencement, and the diminution of bulk goes on steadily to the close. It is probable that, from unknown causes, there may sometimes be a genuine atrophy of the organ; the healthful structure being gradually wasted, without any necessary preliminary congestion, plastic exudation, or fatty degeneration. There is a variety of the affection which Dr. Geo. Johnson originally considered as essentially a chronic desquamative inflammation, differing from the acute in not having been attended with enlargement at any time, but which he subsequently seemed to admit, might not have had an inflammatory origin, and proposed to designate as "chronic desquamative disease of the kidneys." (*Med. T. and Gaz.*, March, 1858, p. 259.) Its essential character appears to be a gradual destruction of the epithelium of the uriniferous tubules, which breaks up into a granular matter, and is thrown off with the urine, partly in an amorphous form, partly in granular casts consisting of the disintegrating and disintegrated cells. The tubules, thus deprived of their cells, and consisting only of the basement membrane, are unable to perform the duty of secretion, and the organ shrinks both by the loss of the proper secreting tissue, and consequently of all the other tissues which are merely tributary to this. The urine in these cases is usually more or less albuminous, as the serous part of the blood escapes with little resistance through the denuded coat of the tubules. Examined by the microscope, it is seen to contain scattered amorphous matter, and large quantities of tubular casts, which are of two kinds, one called *granular* by Dr. Johnson, and consisting of the breaking down epithelium shed by the tubules, and the other *waxy*, consisting of amorphous material, probably thrown out upon the surface of the denuded tubules, and concreting there. Some of the casts are of small diameter, and appear to have come from the surface of the tubules still lined with epithelium; others are much larger, and are supposed to be moulded on their denuded surface. A great predominance of the latter indicates a very advanced stage of the disease; and the total disappearance of the granular casts from the urine is a very bad sign, as it indicates the complete destruction of the secreting tissue. This state of the kidney was noticed by Dr. Todd to be common in old gouty cases, and hence received from him the name of "gouty kidney." It may arise also from other causes, and is a not unfrequent result of intemperance. It is a very fatal form of Bright's disease.

Cirrhosed Kidney.—Fibroid Degeneration.—A portion of the cases of wasted or atrophied kidney are probably examples, in this organ, of the same affection which in the liver is known as simply cirrhosis, and in the pulmonary tissue as cirrhosis of the lungs. Some have given the name of cirrhosed kidney to the form last described; the gouty kidney of Dr. Todd, or "chronic desquamative disease" of Dr. Johnson. But neither of these corresponds exactly with what has been known as cirrhosis. It is probable that the gouty atrophy of the kidney depends on the constant irritation maintained by the gouty disorder in the secretory function of the kidney, which has led finally to a paralysis or loss of power in the cells, and consequently their destruction. The characteristic quality of cirrhosis is the extraordinary development of the connective tissue, producing by pressure a destruction of the cells or proper organ of secretion, and their ultimate annihilation; while by its own contraction it at once aids in this result, and leads to a general shrinking of the organ. Of what nature is the disease of the connective tissue has never been determined; but the view which appears to me most plausible is, that it is a fibroid degeneration of the tissue; or rather the exudation of a morbid lymph, which, instead of being organized into normal areolar tissue, has an imperfect organization of its own, leading to ultimate atrophy. That there is such an affection of the kidney, though very rare, I am convinced, not only by analogy, but by personal observation; as a case occurred to me in which, with all the phenomena of Bright's disease during life, terminating fatally, the kidneys were found much diminished in bulk, and exhibiting a whitish fibroid structure which had displaced almost the whole cortical part of the kidney, leaving, however, a portion apparently normal, and strongly contrasting in colour with the morbid formation.

Causes.—The views just given of the pathological condition of the kidney throw much light upon the causes. It is obvious that whatever is capable of exciting inflammation of the cortical portion of the kidneys, with a special direction to the uriniferous tubules, may give rise to the acute variety of the disease. Hence, cold occasionally acts as a cause, especially when aided by anything calculated to irritate the secreting structure of the gland. Attacks of the disease have also been ascribed to blows or falls on the back. But it is probable that the most efficient agents are those which operate through the blood, and are thus brought to bear immediately upon the seat of the affection. To this source is traced by many the influence of scarlatina, the dropsy following which is now generally recognized as an example of the acute inflammatory form of Bright's disease. By some it is supposed that the direct cause in this case is the scarlatina poison, not thoroughly eliminated in the progress of the fever, and seeking an outlet through the kidneys. The abuse of alcohol may possibly operate in this manner, by a constant over-stimulation addressed to the secreting function of the kidneys.

But the causes of the variety depending on fatty degeneration are very different. It is not over-excitement in this case, but a deficiency of vital power or activity that must be looked to. As taught in the early part of this work, fatty degeneration, wherever found, is probably the result of the predominance of chemical over vital influences. Not only the kidneys, but other organs also suffer in the same way. It has been before stated that Bright's disease is very often attended with fatty liver. Organic disease of the heart is another frequent attendant, and this sometimes has its origin in atheromatous disease of the valves or endocardium, which is an example of fatty degeneration. Phthisis is another not unfrequent associate; and so also is cirrhosis of the liver. It can scarcely be doubted that there is some common origin for all these affections; some state of system in which the powers of life are impaired, and particularly those concerned in the elaboration of the blood. What that particular condition is remains yet to be determined. Intemperance is probably among the most efficient agencies in its production.

In the cases which unite these two forms of renal disease, there may be a mere accidental superaddition of inflammation to an already existing fatty degeneration; or there may have been a predisposition to the latter, which any cause inducing the former may have brought into action. Cold, diverting from the skin to the kidneys, or substances which directly stimulate the latter organ, as oil of turpentine and cantharides, may operate in this way. The inflammation induced may be the first step, which is followed by the fatty degeneration, as the result of the depreciation of the vital forces following over-excitement, and a sort of substitute for suppuration.

In relation to the atrophic state of the kidney, it has already been stated that the affection may frequently be traced to chronic gout, and the abuse of alcohol, both of which probably act by producing and sustaining an excitement of the secretory function which ultimately impairs the powers of the secreting tissue, and favours its degeneration and ultimate destruction. The abuse of other agencies of a similar character, as of the stimulating diuretics, for example, may be supposed to have a similar effect. Dr. Geo Johnson says that this form of the disease is so frequent in gout, that patients affected with the latter complaint, who may find any of the characteristic traits of the former in the condition of the urine, should be especially cautious in regard to diet and other hygienic measures. (*Med. T. & Gaz.*, Oct. 1859, p. 376.)

The notion that the action of mercury is sometimes attended with albuminous urine has induced a suspicion that it might be a predisposing or exciting cause of the disease; but no proof of the fact has been adduced. The puerperal state is thought to favour it. All ages appear to be liable; and, if persons are more frequently affected in middle life, it is probably because they are more apt to be exposed to cold and wet, and more addicted to intemperance, which are thought to be the most powerful known agents in inducing the complaint in one or another of its forms.

Diagnosis.—It is important to be able to distinguish not only Bright's disease in general from other affections, but the different varieties of the complaint itself, according to the state of the kidneys producing it; and the prognosis must in a great degree depend on the decision upon this latter point. In reference to the general diagnosis, the occurrence of general dropsy or anasarca, not clearly traceable to some other source, should induce a suspicion of the existence of this disease, and lead to an examination of the urine. In the absence of dropsy, comatose symptoms or milder cerebral phenomena of the same character, the source of which is unknown, should lead to a similar suspicion and examination. The same, in fact, may be said of any obscure cachectic condition of the system, for which another sufficient cause cannot be found. If, in such cases, the urine be found albuminous, there will be good reason to suppose that Bright's disease may exist; but, as various other affections are attended occasionally with albuminous urine, this alone would be an insufficient test.* If, however, with the presence of albumen, the specific gravity of the urine be steadily below the healthy standard, little doubt of the nature of the disease can be entertained. But it sometimes happens that albumen is for a time wanting in the course of the disease, and in some instances probably throughout the whole case; and, as the density is sometimes, in the acute form, scarcely less than in health, it is advisable to have recourse to the microscope, in order to form a satisfactory decision. Should this detect casts of the uriniferous tubules, whether fibrinous, oily, waxy, or granular, or an unusual proportion of the separated epithelial cells containing oil globules, the evidence may be considered complete.

The acute inflammatory form of the affection is distinguished by the scanty urine, the frequent presence of blood, the large amount of albumen, the comparatively high density of the urine, and the existence in it of fibrinous casts of the tubules with attached or incorporated epithelial cells, and also of separate cells floating in the liquid. If, in addition to these phenomena, there should be casts containing epithelial cells with oil globules, and oil dispersed in the field of the microscope, it may be inferred that the inflammatory affection is in an advanced stage, and perhaps passing into the state of fatty degeneration. In some cases, instead of the oil-containing casts, and the scattered oil globules, there are casts in which pus corpuscles replace the epithelium, and similar corpuscles are diffused in the urine. Dr. Johnson distinguishes such cases by the name of *acute suppurative nephritis;* but with the views of the nature of pus given in this work, there is little difference between these cases and those in which oil is found similarly associated; and in fact the two sometimes occur together. Small fibrinous casts without cells sometimes occur in acute cases, showing that the exudation has taken place on the inner surface of the tubules, without destruction of the epithelium. (*Geo. Johnson.*)

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* The student should be guarded against the assumption that, in consequence of the presence of albumen in the urine in most cases of renal cachexia, its existence in the secretion is an evidence of the existence of the disease. The same error might flow from the frequent use of the term albuminuria as a synonyme of Bright's disease. Now the fact is, that albumen is very often found in the urine in other affections, and in so many others, that it has lost much of its value as a diagnostic sign. In a table given by Dr. Geo. Harley in the *Medical Times and Gazette* (Dec. 1865, p. 596), the following are the circumstances under which albumen has been noticed in the urine, without any evidence whatever of Bright's disease:—the use of improper food and defective digestion; the existence of various nervous affections, as hemiplegia, paraplegia, injury of the brain, lesions of the renal nerves, and pregnancy acting by reflex irritation; and the existence also of various organic diseases, as of the heart, liver, and pancreas. It has been observed, too, in most, if not all of the idiopathic fevers; in pneumonia, pleurisy, bronchitis, and phthisis; in peritonitis and cholera; in erysipelas; and in certain complaints of the blood, as scurvy and purpura. Dr. Pavy states that a great excess of albumen in the food, as in the form of eggs, for example, more than can be appropriated to the use of the economy, is followed by the appearance of that principle in the urine. He found the same result to follow the injection of albumen into the duodenum or the subcutaneous tissue of the lower animals. (*Lancet*, May, 1863, p. 574.)—*Note to the sixth edition.*

In the cases of *exclusive and original fatty degeneration* there is no fever; the state of system is feeble and more or less cachectic throughout; dropsy is perhaps in no case wanting at one period or another of the disease; the urine is generally scanty, albuminous, and of reduced specific gravity, though less so than in the following variety; and the casts in the urine consist exclusively of epithelium loaded with oil globules, which are also diffused through the liquid.

In the *atrophic affection*, the urine is generally copious, of low specific gravity, and often in its course wholly without albumen, and sometimes, according to Dr. Johnson, destitute of it from the commencement.* Granular and waxy casts are seen under the microscope, and abundance of amorphous matter from the disintegration of the epithelium; while the fibrinous casts of acute inflammation, and the oily ones of fatty degeneration are wanting. In some instances of this variety of the disease, its whole course is run, from the commencement to its termination in death, without the occurrence of dropsy. Indeed, the absence of dropsy would seem to be very common; for Dr. Geo. Johnson states that of 38 fatal cases which had come under his notice, only 14 were dropsical. (*Med. T. & Gaz.*, Oct. 1859, p. 376.) The reason of this probably is, that the quantity of urine, instead of being diminished, is often greater than in health. Albumen, moreover, is not unfrequently absent from the urine.

In reference to *waxy* degeneration, Dr. T. Grainger Stewart gives the following characters as sufficiently diagnostic. If the patient, after long suffering with syphilis, scrofula, caries, or necrosis, or other wasting organic disease, or even without any obvious disease whatever, becomes increasingly weak; drinks much, and passes urine proportionably; is affected with slight œdema of the feet and ankles, appearing in the evening and disappearing in the morning; if, with or without enlargement of the liver or spleen, his urine gradually becomes albuminous, and of a low sp. gr., say 1005 to 1015, and in a scanty sediment exhibits a few hyaline or waxy tubular casts; if his blood is found to contain a somewhat undue proportion of white corpuscles, and the red corpuscles, instead of adhering by their faces, are disposed to continue isolated, and to become spindle-shaped; under such circumstances it may be very probably concluded that he is affected with the waxy kidney. If now, after a continuance of months or even years, with alternating amelioration and relapse, he should be at length attacked with ascites or general dropsy, if his urine should become very scanty and highly albuminous, if he should be attacked with severe bronchitis or obstinate diarrhœa, and his strength rapidly give way, if finally drowsiness should appear, followed by coma and perhaps convulsions, it is very certain that death will soon ensue, and that on post-mortem examination his kidneys will be found to be affected with the waxy degeneration. (*Ed. Med. Journ.*, Aug. 1864, p. 97.) The disease, affecting originally, perhaps, only one kidney, or if both but slightly, has now attacked both, or extended so as to involve most of the secreting tissue; the blood not being properly purified, the constitutional symptoms have set in decidedly; and a fatal termination is the necessary result. In reference to the urinary casts, if merely hyaline, that is thin and transparent without apparent structure, though such may appear early in the disease, they must not be looked on as diagnostic, as they occur in other varieties of the complaint; and the same is the case with casts coarsely granular, or containing more or fewer fatty cells; but, if the true waxy casts are seen, which present the characteristic reaction with iodine, &c. (see *page* 610), there can be no doubt of the nature of the disease. (*Ibid.*, p. 108.) The urine should be examined from time to time, as the waxy casts are sometimes absent for two or three days, and then returning may continue as long; so that they may be missed without care. Should the waxy casts alone be found without the oily, the sign is favourable, as it would indicate that only one kidney might be affected, which is not unfrequently the case in this variety; but if oily casts be seen at the same time, the sign is unfavourable; for, when fatty degeneration exists, it is apt to affect both kidneys. (Harley, *Med. T. & Gaz.*, Dec. 1865, p. 624.) Dr. Stewart, though admitting the very great danger of this variety of Bright's disease, is not disposed to consider it as invariably fatal, and has seen it undoubtedly ameliorated by treatment.

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* Dr. Todd, who first showed the connection of this kind of diseased kidney with chronic gout, states that the disappearance of albumen is apt to take place in the intervals of the paroxysms, and that it returns during the paroxysms. (*Dis. of Urin. Organs*, Am. 12.)

I know of no mode of distinguishing the *cirrhosed kidney*, during life, from the other atrophic forms of the disease.

Prognosis.—Now that the pathology of Bright's disease has become better understood, we are able to form more accurate estimates of its degree of danger, and the probabilities of a favourable termination than was formerly possible. I have always been convinced, from the results of my own observation, that the acute form of the disease is generally curable. As this is admitted at present to be essentially inflammatory, there can be no difficulty in adopting this favourable view. Indeed, there can be little doubt that, treated at an early stage, or before the kidneys have been so far destroyed that not enough remains to perform the functions essential to life, it may very generally be cured by the use of efficient means. There is reason to believe that it is even susceptible of a spontaneous cure; the congestion of the kidneys subsiding, and the cells, no longer over-stimulated, returning to their normal state. In relation to the cases dependent on fatty degeneration, the prognosis is less favourable. At an advanced stage, the complaint is often incurable in consequence of the extent to which the kidneys have been destroyed; and not unfrequently, moreover, it is associated with organic diseases which are themselves incurable. But, when not thus accompanied, if treated in the early stage, or while enough of the renal structure remains to answer the purpose of purifying the blood, I have no doubt that a cure is often possible. All that is necessary is to obviate the further deposition or formation of the fatty matter. That which has been deposited may be removed by absorption or elimination. In other cases, where the destruction has been greater, there may be a partial restoration; but the health will be uncertain, and the patient liable to frequent disturbances arising from vitiated blood. In the atrophic cases, and those dependent on fibroid degeneration, there is little or no hope of a favourable termination; at least where both kidneys are involved. When only one kidney is affected, whatever may be the peculiar organic form of disease existing in it, life is not in danger; as the blood is sufficiently purified by increased activity of the function in the sound kidney; and when, along with albuminous urine, and the evidences offered by the microscope of the most threatening renal disease, there may be an absence of dropsy, and all other cachectic phenomena characterizing Bright's disease, the fact may be ascribed to the probable involvement of one kidney only in the morbid state. In any case, the presence of many large casts in the urine, with few or none of the smaller, is a very bad sign, as it indicates a general destruction of the epithelium of the uriniferous tubules, and a consequent irreparable injury of the organ. (*Johnson.*) As a general rule, a relapse is more to be apprehended than an original attack. The test of perfect recovery is a steadily favourable condition of the urine. If, after the patient is apparently well, this should continue to exhibit the characteristic signs of the disease, or if it should reacquire after having lost them, a return of other symptoms may be expected. Dr. Christison considers the danger of the disease to be in proportion to the reduction of the daily discharge of solids in the urine. He states that, when this is so low as one-third of the natural average, the patient may live long in comfortable health; when one-fourth, troublesome secondary symptoms are to be apprehended; and a greater reduction is soon followed by serious disorder, and usually by drowsiness terminating in coma. In the acute form, when there is complete suppression of urine with decided coma, the case may be considered almost hopeless. The same may be said of the chronic form without suppression, when drowsiness has gradually deepened into coma, notwithstanding the employment of suitable remedies. The attendant dropsy and inflammations generally get well under appropriate treatment, though liable to recur. The anemic state may be regarded with apprehension, not only for itself, but because it aggravates, if it does not originate, hypertrophy and dilatation of the heart. Organic cardiac affections, or cirrhosis associated with Bright's disease, are for the most part fatal. M. de Beauvais gives as a never-failing sign of the most dangerous state of Bright's disease, prognosticating almost certain death, an inability of the kidneys to pass odorous substances; so that even asparagus and oil of turpentine no longer impart odour to the urine. (*Arch. Gén.*, Déc. 1858, p. 748.)

Treatment.—As dropsy is the visible affection which is most frequent and most prominent in connection with the disease of the kidney, it usually first engages the attention and efforts of the practitioner. But, in relation to its treatment, nothing could be said in this place different from what has been already said under the head of dropsy in general, to which, therefore, the reader is referred. The various inflammatory affections which may occur in the course of Bright's disease, are to be treated as when they occur under other circumstances, reference being had to the exhausted strength and anemic condition of the patient, in the advanced stages of the chronic complaint, and to the liability to be injuriously affected by mercury. On the present occasion, therefore, I shall treat only of the measures called for by the renal affection, without reference to the secondary complaints.

In the acute form of the disease, blood may be taken freely once or oftener from the arm, followed by cups or leeches to the loins, and by emollient cataplasms when convenient. Should the fever be high, with a hot dry skin, recourse should be had, in the first place, to the refrigerant diaphoretics, including antimonials when there is no nausea, and afterwards, when excitement has been somewhat reduced, to the warm-bath or vapour-bath, aided by Dover's powder repeated every six or eight hours. In cases not attended with much fever, or in which the fever has been in great measure subdued, purgatives may be employed with much benefit. Bitartrate of potassa, given to the amount of from half an ounce to two ounces daily, is probably the most efficient. Should the bowels be torpid, this may be combined with jalap, or the neutral salts and senna may be substituted. But care must be taken not to carry purgation so far as to exhaust the patient; and, should his strength appear to fail, the remedy should be suspended or omitted. The diet should be strictly antiphlogistic, and cool demulcent and acidulous liquids should be given for drink. When excitement has been subdued by these means, but the state of the urine still indicates the continuance of the renal disease, counter-irritation should be made upon the loins by means of ammonia, croton oil, tartar emetic, setons, issues, or moxa. Cantharides should be employed with hesitation, unless in the most advanced stages of the complaint.

The same treatment may be applied to cases in which an acute attack supervenes upon the chronic disease; but bleeding should be employed much less liberally, in consequence of the anemic tendency or condition, which is aggravated by the loss of blood.

Mercury, so useful in most inflammatory affections, is here generally considered of doubtful utility, if not positively injurious. The system is brought under its influence with extraordinary facility; and small quantities sometimes occasion severe ptyalism. One of the worst cases of mercurial sore-mouth which I have ever witnessed, resulted from six to nine grains of calomel, in a case of general dropsy, probably of this character. Mercury is said of itself sometimes to produce albuminous urine, and upon this ground has been feared in Bright's disease. But I believe that it is only in the cases of fatty degeneration that mercury is contraindicated. There it would probably prove injurious, as in scrofulous and other cachectic affections, by still further reducing the vital forces, and impairing the blood. In the inflammatory cases, whether acute or chronic, I would employ it without hesitation should other means fail. Happily, it is now in our power, through recent microscopic discoveries, to diagnosticate such cases with tolerable certainty. When epithelial cells and their nuclei, with entire or broken down casts of the uriniferous tubules, consisting of epithelial cells, their nuclei, and blood corpuscles, united by coagulated fibrin into minute cylinders, are visible in the urine, without oil globules or but few in the cells, the inference is fair, that the case is inflammatory, and that the employment of mercury is justifiable, unless contraindicated by an anemic or otherwise impoverished condition of the system.

In cases strictly chronic, the applications already mentioned to the loins, including cups or leeches where there is lumbar pain or tenderness, Dover's powder and the hot or vapour bath, and the bitartrate of potassa may be used with much benefit. I believe that some of the diuretics are here also useful by their direct action upon the kidneys, altogether independently of their antihydropic effect. In the dropsies with albuminous urine, digitalis has been long known to have a most favourable influence, not only in removing the effusion, but in effecting a permanent cure. This it can do only by modifying in some way the condition of the kidney, possibly by producing an absorption of the morbid deposit which is the root of the evil. It is no doubt capable of producing the same effect in a similar condition of the kidney without dropsy; and should, therefore, be tried in all cases of the disease after due depletion. Its use may often be advantageously combined with that of the bitartrate of potassa. Other remedies having a peculiar influence upon the kidneys may also be tried in chronic cases; the more stimulating substances being restricted to the conditions of greatest debility. Such are squill, uva ursi and pipsissewa, colchicum, horseradish, mustard, copaiba, oil of turpentine, and cantharides. The last-mentioned medicine is asserted to have done good in advanced and debilitated cases, to which alone it is applicable. Objection has been made, on theoretical grounds, to the use of diuretics in this complaint. It is said that the secretory structure is already too much irritated, and can only be injured by additional excitement. But experience is decidedly in favour of these remedies; and in dropsical cases they have been, in my hands, incomparably the most efficacious, both in relieving the dropsical symptoms, and in permanently curing the complaint. Like all other remedies, they require to be adapted to the stage and character of the affection; the refrigerant being used especially in the stage of local excitement, and the more stimulating only when the disease has become decidedly chronic, or is of a low grade from the beginning. We know well that a part chronically inflamed is often most efficiently treated by stimulants to the part; and if fatty degeneration be, as I believe, the result of a low vital action, excitants appear and a consequent irreparable injury of the organ. (*Johnson.*) As a general rule, a relapse is more to be apprehended than an original attack. The test of perfect recovery is a steadily favourable condition of the urine. If, after the patient is apparently well, this should continue to exhibit the characteristic signs of the disease, or if it should reacquire after having lost them, a return of other symptoms may be expected. Dr. Christison considers the danger of the disease to be in proportion to the reduction of the daily discharge of solids in the urine. He states that, when this is so low as one-third of the natural average, the patient may live long in comfortable health; when one-fourth, troublesome secondary symptoms are to be apprehended; and a greater reduction is soon followed by serious disorder, and usually by drowsiness terminating in coma. In the acute form, when there is complete suppression of urine with decided coma, the case may be considered almost hopeless. The same may be said of the chronic form without suppression, when drowsiness has gradually deepened into coma, notwithstanding the employment of suitable remedies. The attendant dropsy and inflammations generally get well under appropriate treatment, though liable to recur. The anemic state may be regarded with apprehension, not only for itself, but because it aggravates, if it does not originate, hypertrophy and dilatation of the heart. Organic cardiac affections, or cirrhosis associated with Bright's disease, are for the most part fatal. M. de Beauvais gives as a never-failing sign of the most dangerous state of Bright's disease, prognosticating almost certain death, an inability of the kidneys to pass odorous substances; so that even asparagus and oil of turpentine no longer impart odour to the urine. (*Arch. Gén.*, Déc. 1858, p. 748.)

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When the system is feeble, and in all instances of fatty degeneration of the kidneys unaccompanied with acute inflammation, recourse should be had to measures calculated to promote the general strength and improve the blood. The chalybeates, quinia, and the mineral acids, especially the nitric and nitromuriatic, may often be used advantageously in connection with a nutritious diet. The preparations of iron are of incalculable advantage in some of these cases connected with anæmia. Perchloride of iron has been recommended, with ergot to check the elimination of albumen. Iodide of iron is preferred by others. Gallic acid also has been recommended. I have used cod-liver oil with apparent benefit, notwithstanding the seeming contraindication of oleaginous substances in cases of fatty degeneration. But I have before expressed my belief that this remedy does not act merely as an oil, but that, in some unknown manner, it improves the blood, and favourably modifies the nutritive function. Iodide of potassium has been found especially useful in the cases of waxy degeneration, associated with syphilis. The hot-air bath and the hot-vapour bath are among the most efficient remedies. I have used the hot-bath with Dover's powder, in order to bring about copious diaphoresis, with the happiest effect in dropsical cases which have resisted diuretics.

Diarrhœa must be treated by remedies addressed to the existing state of the bowels, varying with the precise cause of the affection. As a general rule, acetate of lead, chalk, kino, extract of rhatany, and tannic acid, combined with a little opium, will be found most effectual; but alteratives, such as sulphate of copper or of zinc, copaiba, or oil of turpentine may be required in cases attended with ulceration; and small doses of the mercurial pill or calomel, in others characterized by deficiency or perversion of the bilious secretion.

The disorder of the stomach sometimes calls urgently for relief. It may be treated in the same manner as recommended in dyspepsia. The remedies elsewhere advised for vomiting (see *Vomiting, vol.* i., *page* 679) may be employed for the same purpose in this affection. Creasote in the dose of a drop or two, and officinal hydrocyanic acid in that of four or five drops, three times a day, are said to be peculiarly efficacious.

Should coma occur, the practitioner must be guided by the state of the pulse, and the general strength. If these permit, he will bleed both from the arm, and locally from the temples or behind the ears. A blister should be applied to the back of the neck, the patient should be purged with a dose of calomel, or some one of its combinations, and efforts should be made to restore the action of the kidneys by the free use of bitartrate of potassa, and other diuretics. In the coma of the advanced stages, the last-mentioned remedies are chiefly to be relied on.

It is highly important, both in the course of the treatment, and after apparent cure, that the patient should avoid all known causes of the disease. He should, therefore, carefully guard against cold by wearing flannel next his skin, and shunning all unnecessary exposure to vicissitudes of weather, and should also scrupulously avoid alcoholic drinks, high-seasoned and stimulating food, and all kinds of sensual excess. A nutritious, mild, and digestible diet, pure air, and moderate exercise will tend to confirm the cure, or to protract life in incurable cases. A chief or exclusive diet of milk has been recommended as of itself adequate to cure the disease in its earlier stages. In connection with lime-water, it would be admirably adapted to cases attended with vomiting and obstinate diarrhœa.

Article III.

NON-INFLAMMATORY ORGANIC DISEASES.

The kidneys are liable to most of the morbid alterations of structure found in other organs. A particular description, however, of these affections would be of no practical importance; as they can very seldom be recognized during life by peculiar symptoms. Their phenomena are generally those presented by the more common renal diseases, and often those of chronic inflammation, which, indeed, not unfrequently attends them. Occasionally congenital *malposition* of the kidneys has been observed. Thus, the gland has been found in the pelvis, and in the iliac fossa. The two kidneys have been known to be connected by renal structure running across the spine, constituting what has been named the *horse-shoe kidney*. It has been before stated that, in consequence of obstruction from calculous concretions, or other cause, in one of the calyces or the ureter, distension sometimes takes place; and, in extreme cases, the substance of the kidney is reduced, by absortion or dilatation, to a sort of membranous bag. Generally this violence to the structure of the organ is attended with inflammation; but, if very gradually induced, it may go on to a great extent, even so as to produce a tumour perceptible from without, and yet offer no signs of irritation.

Dislocation of the kidney is a condition of the organ which has recently attracted considerable attention. *Movable kidney* (*Rein flottant*, Fr.), and *displacement of the kidney*, are other names by which the affection is designated. The mere change of position produced by the pressure of other enlarged organs, or the growth of neighbouring tumours, is not included under the name. Allusion is had only to the organ dislocated from its normal position, and more or less movable in the abdominal cavity, exactly as the liver in the cases of dislocation of that organ, described in page 533 of the present volume, under hepatitis. Rayer called attention to the movable kidney so early as 1841. Vague notices of the affection had previously appeared, but little that was very definite. Other writers have since published cases, with more or less extended comments, among whom may be mentioned, Oppolzer in Germany, Dr. Hare in England, and MM. E. Fritz and Becquet of Paris. To the memoir of M. Fritz I am indebted for much of what follows.* It has been supposed that the kidney was especially difficult of dislocation, and that the affection was very rare. It seems, however, that this organ is retained in its place by slight attachments, of which the peritoneal coating is decidedly the most important, and the mass of fat around the gland may not be without effect. But with a removal of the restraint of the peritoneum, the kidney is easily dislocated; and there is reason to think that the accident is much more common than was at one time imagined. It is recognized by the existence of a movable tumour in the abdomen, generally towards one side, which, if the patient is in a horizontal position, with the abdominal muscles relaxed, and especially if he make a full inspiration, may readily be seized between the hands. It is known to be the kidney, from its size, shape, smoothness, and elastic feel under pressure, which are generally quite normal. Sometimes it may be perceived to be connected by a sort of band with the spinal column. In the erect position of the body, it is generally lower down; and in the recumbent, will sometimes retire within the edges of the ribs. In its normal position, instead of the ordinary rotundity of the outer surface, there may be flatness or even a minous flakes, or pus; and, in the advanced stages, is sometimes offensive. Throughout the complaint, it is liable to be contaminated with blood. When it becomes coagulable, without the presence of pus or blood, it may be very probably conjectured that the inflammation has extended to the kidneys.

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* For the accounts of the disease by Dr. Hare, see the *Med. T. & Gaz.*, A.D. 1858, i. 7; by M. Fritz, the *Arch. Gén.*, Août, 1859, p. 158; and by M. Becquet, the *Arch. Gén.*, Jan. 1865, p. 5.

The symptoms of the disease are somewhat different, according to the coat or particular portion of the bladder primarily or chiefly affected. Thus, when the pain is burning, the disposition to pass urine almost constant, the discharge small and attended with ardor urinæ and painful spasm, and mucus present in considerable quantity in the urine, it may be inferred that the disease is chiefly in the mucous membrane. When there is severe pain, with great tenderness above the pubes, and the contraction of the bladder is either very painful or impossible, so as to give rise to retention of urine, while there is little or no strangury, the probability is that the peritoneal coat, and perhaps the muscular, are affected. Severe dysury, excessive pain upon the introduction of the catheter, and tenderness in the perineum, with little or none in the hypogastrium, are signs that the neck of the bladder is especially diseased. The occurrence of tenesmus indicates that the inflammation is at the back of the bladder, and of abdominal pain and tenderness, that it is in the summit. Sometimes the disease runs into the chronic form, and continues for months or years.

Dissection.—The mucous coat exhibits the usual signs of inflammation of that tissue; being reddened in irregular patches, softened, and sometimes partially disorganized. Portions of the surface are sometimes covered with puriform or fibrinous concretion, bearing some resemblance to ulcers. Not unfrequently ulcers exist, which penetrate to the muscular coat. Pus is sometimes found infiltrated in the muscular tissue, or occupying small cavities in the walls of the bladder; and the sinuous passages may occasionally be traced, by which the contents of similar abscesses have escaped. The areolar tissue of the bladder is infiltrated with serum, coagulable lymph, or pus. In some cases, portions of the bladder which had been inflamed are found gangrenous.

Causes.—Mechanical causes often produce cystitis. Such are wounds, falls and blows, the careless introduction of the catheter, severe labours in the female, and stone in the bladder. The last-mentioned cause most frequently induces a chronic inflammation of the mucous coat; but sometimes, aided by rough and sudden movements, as, for example, riding upon a rough horse, it gives rise to an acute attack. Irritating injections into the bladder, distension from retained urine, and the action of certain substances which, when swallowed, have a tendency to pass off by the kidneys, such as cantharides and the oil of turpentine, may produce cystitis. Exposure to cold after being heated is a fruitful cause, especially when a predisposition exists. Among the causes are also enumerated the suppression of habitual discharges, the translation of gout or rheumatism, the retrocession of cutaneous eruptions, and the direct propagation of inflammation from continuous or contiguous structures, as the prostate gland and urethra, the peritoneum, rectum, and womb. The disease is not confined to any age, or to either sex, but is most common after maturity.

Treatment.—When the strength permits, blood should be taken freely, and, if necessary, repeatedly, by venesection; and leeches should be applied copiously, above the pubes, or in the perineum. In severe cases, a calomel purge should be given at the commencement, followed in due time, should it not act freely, by castor oil; and the bowels may afterwards be kept open by the saline cathartics. Emollient cataplasms or warm fomentations, and the warm-bath are useful adjuvants. Large demulcent enemata have been recommended, under the impression that they may act usefully as emollients; but any advantage of this kind would probably be more than counterbalanced by their pressure on the tender bladder. The free use of cold mucilaginous drinks is generally considered useful by increasing the secretion of urine, and rendering it less irritating; and such is probably the case when the mucous membrane chiefly is affected; but, when the inflammation is seated in the muscular and peritoneal coats, so as to prevent contraction of the bladder, and thereby induce retention of urine and consequent distension of the viscus, an augmentation of the secretion is scarcely desirable. Under such circumstances, it would be proper that the patient should take no more liquid than is necessary to satisfy urgent thirst, and that what he may swallow should be tepid, so as to direct action rather to the skin than the kidneys. In general there is a decided indication for the promotion of diaphoresis. In the earlier stages, this may be done by the use of citrate of potassa, acetate of ammonia, and the antimonials when there is no nausea. Should the stomach be irritable, the effervescing draught would be preferable, from its anti-emetic as well as diaphoretic property. The action of these medicines may be favoured by the vapour-bath. After depletion, Dover's powder should be preferred. Great advantage will often accrue from anodyne enemata, in all stages of the disease, after the bowels have been thoroughly evacuated. They not only relieve the distress, but are positively therapeutical by preventing in some measure those violent efforts at micturition, which cannot but aggravate the complaint of the bladder. They sometimes greatly facilitate the evacuation of the urine. When the urine is decidedly acid to test-paper, great advantage will often accrue from neutralizing it, by means of half a drachm of bicarbonate of soda three times a day, taken in carbonic acid water. In cases of distension of the bladder, it becomes necessary to draw off the urine by the catheter, which, however, should be used with caution, and never officiously, for fear of irritating the inflamed membrane unnecessarily.

If the inflammation has followed the disappearance of external gout or rheumatism, attempts should be made by stimulant applications, such as mustard, Cayenne pepper, ammonia, hot water, &c., to bring back the disease to its original seat; while, in addition to the ordinary measures for the cure of cystitis, one of the preparations of colchicum should be administered internally. When a repelled or retrocedent cutaneous eruption has been followed by the disease, frictions with croton oil or tartar emetic may be found useful, by substituting another eruption for that which has disappeared.

In the advanced stages of the disease, fly blisters over the pubes, or on the upper and inner part of the thigh, have been advised; but, in consequence of their liability to produce strangury, they should be used cautiously if at all, should not be allowed to remain on more than from four to six hours, and should be followed by emollient poultices. But, on the whole, blistering by solution of ammonia would be preferable; and, if a permanent rather than a hasty impression be desirable, antimonial pustulation, or the use of a seton or issue, may be better than either.

Should the disease resist depletion, mercury may be employed with a view to a moderate impression on the system. Calomel combined with opium, and, if the stomach is not irritable, with ipecacuanha, is perhaps the best preparation for the purpose. One or two grains of calomel with a grain of opium may be given every four, six, or eight hours, according to the urgency of the case.

The diet should in the early stages be of the mildest kind, consisting exclusively of farinaceous, mucilaginous, or saccharine drinks. When the disease is more advanced, and suppuration has set in, more nutritious food may be given, and in some cases is absolutely required. Porter or ale may be allowed when the debility is great.

Chronic Cystitis.—*Chronic Mucous Inflammation of the Bladder.—Cystirrhœa.—Catarrh of the Bladder.*—Though in acute cystitis there is often a flow of mucus from the bladder, yet this is a much more striking phenomenon in the advanced stages of the disease, when it may be considered as having assumed the chronic form; and, in many cases, the grade of inflammation from the commencement is such that the affection may be regarded as of that form throughout. Catarrh of the bladder is, therefore, treated of here as a chronic disease.

Symptoms.—The complaint sometimes comes on gradually, so that it is impossible for the patient to fix precisely the period of its commencement. In other instances, the onset is more abrupt. The symptoms are, for the most part, those of acute cystitis in a greatly mitigated form. There is more or less uneasiness, dull or shooting pain, or sense of morbid heat in the region of the bladder; also frequently a feeling of weight in the perineum, and irritation about the rectum and anus. With these is always associated a disposition to pass urine more frequently than in health. Sometimes this desire is very urgent, while the discharge is attended with straining, spasm of the bladder, and burning and shooting pains along the urethra. The patient often complains also of a feeling of weakness in the loins. There is usually a slight fever, with anxiety, restlessness, and general distress.

But the distinguishing feature of the complaint is the altered character of the discharge from the bladder. Soon after the occurrence of the symptoms mentioned, and sometimes without them, the urine assumes a whitish, somewhat turbid appearance, owing to mucus and the epithelial scales, the deposition of which leaves it again nearly clear. The mucus increases, sometimes readily mixing with the urine, sometimes separating from it, upon standing, in the form of a viscid tenacious matter, which cannot be made to mix with it again. The quantity of this mucous discharge is often very great, amounting, according to Prout, in some cases, to several pints daily. Not only does it now come away with the urine, but it occasionally also passes nearly or quite unmixed, and is sometimes so thick as to be moulded by the urethra as it escapes, and even to obstruct the passage for a time. In this state, it is sometimes so irritating as to occasion severe burning pain in the urethra. Its consistence is such that, when the vessel containing it is inverted, it still keeps its place. At first the mucus is whitish or opalescent; but at length it becomes yellowish or greenish and quite opaque, obviously from the presence of pus. The urine itself is at length changed, being turbid even after standing, albuminous, and alkaline. Occasionally blood appears in it from the beginning in small quantities. Large quantities of the phosphates are sometimes precipitated by the alkaline secretion from the bladder, so as, when mixed with the mucus, to give the urine a purulent appearance, though no pus corpuscles may be detected by the microscope. In such cases, crystals of the phosphate of magnesia and ammonia may be seen by placing a portion of the urine between plates of glass, and submitting it to microscopic inspection. This condition may be readily distinguished from the purulent by the reaction of liquor potassæ, which does not affect the phosphates, while it produces with pus a viscid, glairy, mucous-like substance. The urine, under these circumstances, may also have an offensive odour. (Golding Bird, *Urinary Deposits*, Am. ed., p. 154.) In the advanced stages, when there is reason to believe that ulceration has occurred, considerable hemorrhage from the bladder is not very uncommon.

If the disease continues to advance, the pains are increased and extended to neighbouring parts, especially to the anus and down the thighs; the dysury also increases; the mucus is in great measure replaced by pus; the general strength gives way; rapid emaciation takes place; and the patient dies in a hectic state, worn out by irritation and the exhausting discharge. Not unfrequently the fatal termination is preceded by a period of comparative ease. Towards the close, the urine assumes the appearance of the washings of flesh, being deep-coloured, albuminous, and alkaline, with an ammoniacal odour. But at the very last, the quantity both of urine and muco-purulent matter discharged is greatly diminished; and the urine sometimes recovers its natural acidity, probably because it ceases to be contaminated with secretions from the bladder

Dissection.—In old fatal cases, the mucous membrane is often much disorganized. In some instances, it exhibits dark-red or purplish irregular patches, in others, is little discoloured. It is extensively softened, ulcerated, and sometimes almost wholly destroyed The muscular coat is often much thickened, contracted, and of a firm consistence, probably in consequence of the incessant efforts at micturition In such cases, the mucous membrane, which cannot so readily change its dimensions, is thrown into folds, occasionally forming a species of sac, in which calculous matter is deposited, while the prominent ridges are reddened and abraded. Sometimes the ulceration penetrates through the parietes into neighbouring organs. Not unfrequently the ureters are enlarged, and signs of inflammation are observed in the pelvis of the kidneys.

Causes.—Most of the causes of acute cystitis are capable of producing this affection, when operating in a less degree, or upon a less inflammatory constitution. It is unnecessary to repeat them. Besides those already enumerated, the irritating properties of the urine sometimes secreted by diseased kidneys, and excessive venereal indulgences, may be mentioned. In most instances in which the disease has been induced by some exciting cause, it is probable that a predisposition has existed which has given effect to its action. Such a predisposition is supposed sometimes to be inherited, as when it is found in scrofulous and gouty individuals; and is sometimes induced by certain influences long continued, as by a residence in cold and damp climates, the abuse of alcoholic drinks, the undue use of high-seasoned animal food, and by sedentary habits, especially when combined with vicious indulgences Cystirrhœa is frequently associated, either as effect or cause, with inflammation of other neighbouring parts, especially the prostate gland, the urethra, and the lower extremity of the rectum. Stricture in the urethra probably sometimes acts as a predisposing cause. The disease is more common in men than in women, and in the old than the young.

Prognosis.—Cystirrhœa will generally get well under proper treatment in the early stage, unless there be some strong constitutional predisposition, or the causes which produced it continue to operate. In some instances, recovery appears to take place in consequence of the supervention of an acute attack of disease elsewhere, as of bronchitis or gastritis. After suppuration has been fairly established, the chances are diminished, though still the patient may often get rid of the disease with due care. It is very apt, however, even when it does not destroy life, to continue long, occasionally for many years, greatly distressing the patient, and sometimes even rendering existence burdensome. Gangrene is necessarily fatal. Occasionally it is associated with incurable organic disease of the kidneys, as carcinoma, or tubercles, the softened matter of which may escape with the urine, and irritate the surface with which it comes in contact. The worst case of cystirrhœa that I have seen was of this kind.

Treatment.—Depletion is seldom requisite, unless occasionally by leeches applied over the pubes or in the perineum, near the commencement of the disease, or after some fresh accession of inflammation in its course. The bowels should always be kept soluble, and sometimes, when there is fever, moderate purgation with the saline cathartics is desirable. As laxatives, magnesia, castor oil, the lenitive electuary, or sulphur may be used. Those cathartics which especially irritate the rectum should be avoided. Dover's powder at night. and the frequent use of the warm bath are often beneficial. Anodynes are almost indispensable to control the excessive irritation which is apt to attend the complaint. Opium as a suppository, or some one of its liquid preparations given as an enema, is perhaps the most effectual. But, when this narcotic is from any cause contraindicated, hyoscyamus, conium, lactucarium, extract of hemp, camphor, or bromide of potassium, may be substituted, either separately, or variously combined. In very protracted cases, it may be advisable to alternate one or more of these anodynes with opium, so that the system may not lose its susceptibility to the latter drug.

When the disease is decidedly chronic, and especially in its advanced stages, remedies may be resorted to which have the property of passing off by the kidneys, and thus impregnating the urine. Many of these have been used with more or less success. The turpentines or their volatile oil are among those most employed. In Europe, the Venice, Chian, or Strasburg turpentine has been given; in this country, the oil of turpentine is usually preferred. Of the latter, from ten to thirty drops may be given three or four times a day. Copaiba and its volatile oil have similar properties, but are more apt to offend the stomach. Buchu has been much commended, and has the advantage of not nauseating. Other remedies of analogous character are cubebs, balsams of Tolu and Peru, tar-water, and creasote. Certain tonics and astringents, supposed to have a peculiar action on the urinary passages, have enjoyed considerable credit. Such are especially uva ursi, pipsissewa, and pareira brava. Other tonics, having no such peculiar influence, are also occasionally useful. Hops are sometimes advantageous both as a tonic and narcotic. Sulphate of quinia, the mineral acids, and the preparations of iron have also been commended. The tincture of the chloride of iron is supposed to be peculiarly useful from its tendency to the urinary organs. The tonics may often be advantageously combined with some one of the narcotics above mentioned. In gouty cases, colchicum may prove useful. Measures must be employed to correct any irritating condition of the urine arising from unhealthy action of the kidneys. (See *Lithiasis.*) Dilute phosphoric or other mineral acid, or benzoic acid may be given when the bladder is loaded with the earthy phosphates.* Recourse should be had to mercury upon the failure of other means of cure, unless some strong objection exist from the state of the constitution in any particular case. No remedy is more powerful than this in chronic mucous inflammation.

Local measures should not be neglected. Though less efficient than in more recent cases, counter-irritation may be resorted to with some hope of benefit. This may be effected in the manner recommended under the preceding head. M. Chopart strongly advises the use of injections, and they have frequently been employed by others. It is necessary, however, that much caution should be exercised in their use, in order not to irritate the bladder. The liquid injected should be introduced very slowly, almost drop by drop; and violent distension should be most carefully avoided. A double catheter has been recommended, so that the liquid which enters the bladder through one passage may escape from it by the other. In the earlier stages, only demulcent or emollient liquids should be thrown up, such as barley-water, flaxseed tea, decoction of marsh-mallow, &c; but, in the more advanced stages, astringent and mildly-stimulating substances may be used; the caution being observed always to begin with the solution very weak, and gradually to increase the strength as the organ is found to bear it. At first, two or three grains of sulphate of zinc or acetate of lead, or one grain of corrosive sublimate or nitrate of silver, may be thrown up dissolved in four fluidounces of pure water. Solution of nitrate of silver has been of late especially recommended, having been found successful in several cases. The strength may be increased gradually from one to four grains to the fluidounce of water, and the injected solution may be allowed to remain about a minute. Nitric acid in the proportion, to begin with, of one minim to two fluidounces of water, is employed by Brodie; the bladder being first washed out with warm water, and the diluted acid suffered to remain not more than half a minute after injection. Acid injections are peculiarly useful when the urine contains the insoluble phosphates. Dr. Golding Bird has seen cases of this kind yield to these injections, after resisting all other treatment. He employed muriatic acid in the quantity of ten minims, with twenty minims of wine of opium, thrown into the bladder daily with a sufficient quantity of barley-water. (*Urinary Deposits*, Am. ed., p. 157.) Tar-water and a weak solution of creasote have also been used in the same way. M. Bretonneau injects four or five grains of calomel rubbed up with mucilage. The injection may be repeated at first every other day, and afterwards, when the bladder becomes habituated to the impression, daily. In acute cases, or even in chronic cases upon which acute symptoms have supervened, I should fear even the mildest injections, lest more harm should result from their mechanical irritation than good from any alterative or demulcent effect.

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* Dr. G. Owen Rees, however, believing that the phosphatic deposition depends on the alkalinity of the mucus secreted, and that this was intended by nature to obviate the irritating properties of the acid urine as it comes from the kidneys, prefers the use, along with demulcent drinks, of alkaline salts, such as the citrate and tartrate of potassa, which render the urine from the kidneys alkaline, and, diminishing in this way its irritating property, remove one impediment to the cure of the inflammation. (*Lond. Med. Gaz.*, July, 1851, p 35.)

The diet should be mild and nutritious, and such as can have no tendency to occasion urinary deposits. The farinaceous substances, milk, and boiled meats in moderate quantity may be used; but, upon the supervention of acute symptoms, animal food should be for a time suspended. Stimulating condiments and alcoholic drinks should be avoided, unless in cases of considerable debility, and where the system has been long accustomed to them; and, even in the latter case, it would be best that they should be gradually withdrawn. Mucilaginous drinks are upon the whole most suitable. Moderate exercise and fresh air are desirable, for the sake of the general health; but fatigue, and all jolting or jarring motion, and exposure to cold and wet should be avoided. To guard against vicissitudes of weather, the patient should wear flannel next his skin. Advantage will often accrue from the use of the natural mineral waters, especially those which are mildly chalybeate and laxative; and sea-bathing is said to have done much good. A residence in a warm climate during the winter is also considered advantageous.

Article V.

DISEASES OF THE PROSTATE.

1. Acute Inflammation.—*Prostatitis.*—This disease comes on with a feeling of weight and tension in the perineum, soon followed by a heavy, pulsative, or burning pain, which is increased by pressure, by the sitting posture, and by the act of evacuating the bowels. Indeed, the uneasiness during defecation is so great that the patient is usually indisposed to go to stool, and the bowels are consequently apt to become costive. Very soon after the first occurrence of pain, a disposition to pass the urine more frequently than in health begins to be felt, which gradually increases until it becomes very urgent and almost incessant. But much difficulty is experienced in the act of micturition; and at length the urine escapes only by drops, often high-coloured, sometimes mixed with mucus or blood, and usually producing a severe burning pain in its passage. Not unfrequently complete retention takes place, and the bladder suffers a very painful distension. Along with these symptoms there is generally fever, which is sometimes of a high grade, with a strong full pulse, hot skin, loss of appetite, a furred tongue, &c.

If an examination be made by the finger in the rectum, the prostate will be found considerably enlarged, and painful to the touch. A catheter introduced into the urethra meets with some resistance when it reaches the position of the gland, and if now pushed forward excites violent pain and burning, and enters the bladder with difficulty.

The disease under proper treatment not unfrequently subsides, and goes off by resolution; a glairy discharge sometimes taking place from the excretory ducts. But the termination is not always so favourable. Sometimes the inflammation travels to the bladder, and the dangers of cystitis are added to those of the original complaint. Sometimes it only partially recedes, and the gland is left in a state of chronic inflammation. More frequently, if not arrested, it ends in suppuration. The occurrence of this is sometimes marked by rigors; and the existence of an abscess may be occasionally ascertained by the feeling of fluctuation imparted to the finger in the rectum. At length the abscess opens, most frequently into the urethra, sometimes into the bladder or rectum, and now and then also, though rarely, through the skin of the perineum. Brodie says that the route by the perineum is the most frequent; but other surgeons of high authority, among whom are Velpeau and Amussat, make a different statement. When the abscess presents towards the urethra, it is not unfrequently ruptured by the introduction of a catheter; when towards the rectum, it gives rise to much uneasiness in the rectum and the anus, and so presses upon the intestine that a stool is for the time impossible, and even moderate injections are refused admission. The point of the syringe sometimes occasions extreme suffering. After the opening of the abscess, the patient becomes quite easy, and is generally soon restored to health. The whole course of the disease is usually completed in a week or ten days.

Causes.—The most frequent cause of this disease is gonorrhœa, the inflammation of which passes by continuous propagation to the prostate. It is asserted by Velpeau that this is peculiarly apt to take place, when heating remedies, such as cubebs and copaiba, are employed in the treatment of the urethral complaint. Other causes are cold suddenly applied to the perineum, falls or blows upon the same part, and the unskilful introduction of the catheter, in cases of chronic enlargement of the gland so common in advanced life. Cathartics, such as aloes, which act especially on the pelvic viscera, venereal excesses, masturbation, intemperate drinking, and violent riding on horseback, are also considered as among the predisposing or exciting causes. It seldom occurs before puberty, and not often in old age, unless by supervention upon an already enlarged prostate.

Treatment.—Bleeding, leeches to the perineum, emollient poultices, the warm hip-bath, mucilaginous drinks, rest, and a rigid antiphlogistic diet are the chief remedies in the early stages. Opiates, either by the stomach or rectum, may be employed to relieve pain and procure sleep. When the distension of the bladder is very considerable, attempts must be made to obtain relief by the catheter, though the introduction of the instrument is exquisitely painful. Inhalation of ether will facilitate the operation. Should an abscess have formed, it should be opened as soon as possible, wherever it can be ascertained to present. But this is a point for the consideration of the surgeon.

2. Chronic Enlargement.—This affection is very common in old age. As it usually occurs, it comes on gradually, without pain; and the first symptoms which attract attention are those which arise merely from the bulk and position of the tumour. Sometimes there is a vague feeling of uneasigin with the solution very weak, and gradually to increase the strength as the organ is found to bear it. At first, two or three grains of sulphate of zinc or acetate of lead, or one grain of corrosive sublimate or nitrate of silver, may be thrown up dissolved in four fluidounces of pure water. Solution of nitrate of silver has been of late especially recommended, having been found successful in several cases. The strength may be increased gradually from one to four grains to the fluidounce of water, and the injected solution may be allowed to remain about a minute. Nitric acid in the proportion, to begin with, of one minim to two fluidounces of water, is employed by Brodie; the bladder being first washed out with warm water, and the diluted acid suffered to remain not more than half a minute after injection. Acid injections are peculiarly useful when the urine contains the insoluble phosphates. Dr. Golding Bird has seen cases of this kind yield to these injections, after resisting all other treatment. He employed muriatic acid in the quantity of ten minims, with twenty minims of wine of opium, thrown into the bladder daily with a sufficient quantity of barley-water. (*Urinary Deposits*, Am. ed., p. 157.) Tar-water and a weak solution of creasote have also been used in the same way. M. Bretonneau injects four or five grains of calomel rubbed up with mucilage. The injection may be repeated at first every other day, and afterwards, when the bladder becomes habituated to the impression, daily. In acute cases, or even in chronic cases upon which acute symptoms have supervened, I should fear even the mildest injections, lest more harm should result from their mechanical irritation than good from any alterative or demulcent effect.

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1. Acute Inflammation.—*Prostatitis.*—This disease comes on with a feeling of weight and tension in the perineum, soon followed by a heavy, pulsative, or burning pain, which is increased by pressure, by the sitting posture, and by the act of evacuating the bowels. Indeed, the uneasiness during defecation is so great that the patient is usually indisposed to go to stool, and the bowels are consequently apt to become costive. Very soon after the first occurrence of pain, a disposition to pass the urine more frequently than in health begins to be felt, which gradually increases until it becomes very urgent and almost incessant. But much difficulty is experienced in the act of micturition; and at length the urine escapes only by drops, often high-coloured, sometimes mixed with mucus or blood, and usually producing a severe burn-to the circumstances of the case, and the views of the practitioner. Calomel or the blue mass is the most suitable preparation of the former, and iodide of potassium of the latter, unless the iodide of mercury, which combines the two, may be considered preferable. To be of effect, they must be used moderately, and persevered in for a long time. Fischer, of Dresden, has employed muriate of ammonia, in large doses, with extraordinary success. Beginning with fifteen grains every two hours, he gradually increases until nearly half an ounce is taken daily; diminishing the dose if disorder of the stomach, or scorbutic symptoms appear. (*B. and F. Medico-chirurg. Rev.*, Oct. 1852, p. 557.)

Issues in the upper and inner part of the thighs are said to have done some good. The bowels should be kept in a soluble state, so as to prevent the hardened feces from irritating the gland in their passage. No irritating cathartic or diuretic should be allowed. Various mechanical remedies have been proposed, as compression, cauterization, incision, &c ; but these fall exclusively under the charge of the surgeon. The patient should be cautioned against straining in the evacuation of his urine, and to control, as far as possible, the disposition to frequent micturition. If he should be unable to evacuate the bladder, it will be necessary to resort to the catheter, the use of which then becomes important not only for present relief, but to check the progress of the complaint, by preventing the distension of the bladder. It is a question for the surgeon to decide, whether the catheter is to be left always in the urethra, or whether it is to be introduced three or four times daily. One plan is best adapted to certain cases, the other to others. There is often much difficulty in introducing the catheter, requiring a dexterous operator

In some instances of chronic inflammation of the prostate, there is an excessive flow of its secretion, which gives rise to a very obstinate variety of gleet. This is apt to happen as a sequela of gonorrhœa. The disease is most effectually treated by the application of nitrate of silver to the surface of the urethra, where it is embraced by the gland.

3. Other Organic Affections.—*Calculous concretions* occasionally form in the ducts of the prostate and acquire great dimensions. These are properly objects for the care of the surgeon. *Tubercles* are said to have been noticed in the prostate. But there is no sign by which, during life, they could be distinguished from other chronic affections of the gland. The prostate is also subject to *scirrhus*, either as an original affection, or by propagation from neighbouring parts. The hardness of the gland, the communication of the induration to the structures about it, the lancinating character of the pain, and the peculiar cachectic complexion of the patient are the chief diagnostic symptoms. The treatment can be only palliative, and must consist chiefly in the free use of narcotics, and the avoidance as much as possible of all irritating influences.

Article VI.

FUNCTIONAL DISEASES OF THE URINARY ORGANS.

UNDER this title are here included all the diseases of the urinary organs not consisting in organic derangement; consequently all their states of irritation or depression, whether merely nervous, or involving also the blood-vessels, and all the deviations from the healthy performance of their functions, whether secretory or excretory. These diseases may be conveniently arranged in two divisions; the first including affections purely nervous, the second disorders of secretion and excretion.

1. *Nervous Affections.*

1. Neuralgia.—The kidneys, bladder, and urinary passages in general, are liable to attacks of pure neuralgia. These are characterized by pain, generally very acute, without any evidence whatever of inflammation or considerable vascular excitement, and without spasm. They are not attended with material alteration of the urine, with pain or other irregularity in its evacuation, or with fever; and, if nausea and vomiting sometimes occur, it is merely in consequence of the close sympathetic connection between the stomach and urinary apparatus. The pains are usually in irregularly recurring paroxysms, sometimes only remitting, sometimes quite ceasing in the intervals. Occasionally they assume a regular periodical form. When they occupy the kidney, they generally shoot downwards towards the groin, as in nephritis; and in this position the complaint may be denominated *nephralgia*. When seated in the bladder, they are felt above and behind the pubes or in the perineum, and occasionally extend to the penis.

The causes are the same as of neuralgia elsewhere. The complaint probably, in some cases, originates in the nervous centres, whence the organs receive their immediate supply of nervous influence; in others, may depend on the action of miasmata or upon general debility; and in others, again, may be traced to a gouty or rheumatic diathesis, in constitutions not vigorous enough to rise readily to the point of inflammation. Occasionally it appears to be connected with hysteria.

The treatment is the same as that of neuralgia seated elsewhere, and is given under the general heading of that disease. It may not be improper, however, to mention here that, when regularly intermittent, it will generally yield to anodynes during the paroxysms, and large doses of quinia in the intervals. It is referred to at present less in relation to therapeutics than to diagnosis. The practitioner should be especially cautious not to confound it with inflammation; as the two affections require a quite different treatment.

2. Calculous Nephralgia. — *Spasm of the Ureters.* — *Nephritic Colic.*—This is one of the most painful affections to which the human frame is liable. It depends upon the passage through the ureter of a calculus or other solid body, coming on when this enters the duct upon leaving the pelvis of the kidney, and rarely ceasing entirely until it is discharged into the bladder. The pain is probably excited immediately, either by the roughness of the calculus wounding the mucous membrane, or by its size producing distension. There is reason to believe that concrete organic matter, as blood or fibrin, may sometimes give rise to the affection.

During an ordinary attack of gravel, or in the midst of apparent health, a severe pain is suddenly felt in the loins, shooting to the groin, testicle, or thigh, and often extending into the abdomen, where it imitates colic. Occasionally it is felt chiefly or exclusively in and about the hip. The space between the ilium and umbilicus is sometimes acutely sensitive to pressure. The pain occurs usually in irregular and excruciating paroxysms, having all the characters of spasmodic attacks, with intervals of comparative ease. During the severity of the paroxysm, there is often nausea or vomiting, and sometimes a small and very feeble pulse, great apparent prostration, a cool pale surface, and profuse sweat. A desire to pass urine frequently, but with little success when the effort is made, is another symptom. The patient is usually restless, rising frequently from bed, and seeking relief, though in vain, from every change of position. At length the calculus escapes into the bladder, and the pain suddenly ceases. Not unfrequently, however, it is renewed after some hours or a few days, in consequence of another concretion entering the ureter, and pursuing the same course. Occasionally it appears to go off entirely without the expulsion of the calculus, returns again after a considerable interval, and at length finally ceases upon the escape of the offending cause. It is important that the calculus should be seen in the urine, as otherwise there might be reason to fear lest it should still be lurking in the pelvis of the kidney after vain efforts to enter the ureter, or, being detained in the bladder, should become the nucleus of a stone. Hence the propriety of examining the urine, and, if the calculus should not be found, and especially if there should be signs of its presence in the bladder, of directing the patient to retain his urine, drinking freely at the same time of cool liquids, until the bladder should be filled, and then to discharge it in a full stream with his body bent forward. Should it still remain in the bladder, or be caught and fixed in the urethra, the aid of the surgeon should be called in.

This affection is different from nephritis, and requires a different treatment. The pain comes on before there has been time for the development of inflammation, and does not in any degree necessarily depend on that cause. Should the calculus, however, be detained long, inflammation will ensue; and then the two affections will coexist. The total absence of fever, while that affection always attends acute nephritis, is generally sufficiently diagnostic of the nature of the complaint. Its sudden commencement, and its equally sudden and often complete departure, are other evidences of its nature. In the nephralgic disease, moreover, the kidney would not probably exhibit an equal sensibility to strong pressure as in nephritis.

The origin of the pain in the loins, its course along the ureter, the occasional retraction of the testicle, the disordered micturition, and the frequent presence of sandy or amorphous deposit in the urine are usually sufficient to distinguish this complaint from colic and peritoneal enteritis, the former of which, moreover, is in general more decidedly paroxysmal, and more exempt from abdominal tenderness, while the latter is accompanied with high fever.

Occasionally most of the symptoms above described occur without the passage of a calculus at the time, or, so far as can be discovered, afterwards. It is possible that, in such cases, they may be owing to coagulated organic matter which has subsequently been broken up in the bladder; or there may be in the ureter a power of idiopathic painful contraction analogous to spasm.

Treatment.—The prominent indications are to relieve the suffering of the patient during the passage of the calculus, and to render this passage as speedy as possible. If the pain should not be very severe, the bowels should first be evacuated by a full dose of castor oil or other mild yet quick cathartic, so as to prevent irritation from feculent accumulation. The cathartic may be aided, if it do not operate speedily, by a purgative enema; and, in cases attended with much irritability of stomach, the latter remedy may be employed to the exclusion of the former. After the bowels have been emptied, opiates should be given promptly and freely. When the pain is extremely violent, it is best not to wait for the action of cathartic medicine, but immediately to administer opium, while an attempt is made, at the same time, to evacuate the lower bowels by an enema containing a portion of oil of turpentine, with other milder ingredients. One or two grains of opium, or an equivalent dose of laudanum, black drop, or one of the salts of morphia, should be given at first, and repeated at intervals of half an hour, hour, or two hours, according to the urgency of the pain, until this is somewhat alleviated, or the patient exhibits signs of narcotic influence. Should the stomach be irritable, the opiate may be administered with as powerful and prompt effect by the rectum, in double or triple the dose. From forty to sixty or even eighty drops of laudanum may thus be given in a wineglassful of thin starch, and repeated if necessary. If relief should not be afforded by these measures, the patient should be immersed in a warm bath, and kept in it for an hour or more if he bear it well.

Indeed, it will generally be proper to have the bath prepared immediately, and used as soon as ready, while the other measures are in progress. Hot fomentations to the abdomen and loins may also be employed. In vigorous individuals, should relief not be quickly obtained, it will be proper to bleed from the arm, in order both to favour the passage of the calculus by producing relaxation, and to obviate inflammation. This is one of the affections in which great advantage may be expected from the inhalation of ether or chloroform. In cases in which the calculus is engaged in the entrance of the ureter, producing obstruction, and unable to pass, temporary relief may possibly sometimes be obtained by inverting the body, as practiced by Dr. Simpson, of Edinburgh, so as to cause the calculus to fall back into the pelvis of the kidney. (*Ranking's Abstract*, xxviii. 130.) This measure is of course inapplicable to cases in which the calculus can escape through the ureter, unless the symptoms at the moment be extremely urgent, and temporary relief all-important.

The means calculated to prevent the return of the disease depend, in great measure, upon the character of the urinary deposits, and the nature of the calculus. The subject will, therefore, be most conveniently treated of under lithiasis.

3. Spasm of the Bladder.—This is marked by violent pain, with a feeling of constriction in the region of the bladder, which is sometimes contracted into a hard ball. The pain often extends to the penis producing erection, to the rectum producing tenesmus, and even to the kidneys, with symptoms like those of the nephralgic paroxysm. Sometimes the contraction is so great and so permanent as to close the orifices of the ureters, and thus to occasion an apparent suppression of urine, which, however, accumulates in the pelvis of the kidney, and leads to serious irritation of that organ. During the paroxysm, the patient is sometimes affected with cold perspiration, paleness of surface, feeble pulse, great restlessness, and general distress. Often, however, the spasm is less violent and continuous; and the affection altogether much more moderate. From cystitis it is distinguished by the absence of fever, the want of pain on pressure, and its paroxysmal character.

Spasm of the bladder may proceed from stone, acrid urine or other morbid renal secretion, similar morbid secretions of the bladder itself in a state of organic disease, the direct irritation of cantharides or other acrid diuretic taken into the stomach, sympathetic irritation occasioned by ascarides in the rectum, gout and hysteria, and finally exposure to severe cold. When connected with long-continued organic affections of the kidneys or bladder in old people, it is sometimes the immediate cause of death by its shock upon the already exhausted nervous system. It is almost always susceptible of relief when idiopathic, and often ceases without the intervention of remedies.

Treatment.—It is obvious that, when the spasm depends on any discoverable source of irritation, this must be removed if possible. So far as regards the spasm itself, it is most effectively treated with opiates, especially in the form of enema, and freely administered. Warm fomentations, and the warm bath are excellent adjuvants. Sinapisms above the pubes are sometimes useful; and the effect of a stream of cold water poured from a height out of a pitcher upon the hypogastrium may be tried. In robust individuals, blood may be taken from the arm; and, should the disease be complicated with inflammation, both this and leeching would be called for. If the spasm has ensued upon the disappearance of gout, colchicum should be given with the opiate, and the disease invited to its original seat by rubefacients. If it is purely nervous, the antispasmodics may be employed, such as assafetida, Hoffmann's anodyne, camphor, musk, and valerian, separate or combined; and advantage may accrue from the simultaneous use of tonics. Ethereal inhalation has been found to afford speedy relief to the sufferings of the patient, and the same result may be expected from chloroform.

4. Irritable Bladder.—This name has been applied to states of the bladder, however various, in which that organ shows, by an increased frequency of action, either a morbidly increased susceptibility to the stimulus of the urine, or an altered and more stimulating condition of the urine itself. Thus employed, however, it is obvious that the name cannot be considered as expressive of a peculiar disease, but rather of an association of symptoms belonging to several distinct pathological conditions. These symptoms are a disposition to frequent micturition, more or less uneasiness if the urine is retained, and inability to retain it long, and often only a partial relief when the desire is yielded to. Now this state of things may be dependent on acrimony of the urine, arising from organic or functional disease of the kidney, or from spontaneous decomposition in consequence of being retained too long in the bladder; on unhealthy secretions, other than urine, from either of these organs; on organic disease of the bladder itself; on irritation propagated to it sympathetically from neighbouring parts, as the kidneys, prostate, urethra, and rectum; or finally on an exalted susceptibility, which renders it morbidly sensitive, even to ordinary impressions. In all these cases, except the last, the irritability is secondary, and is to be considered in connection with the various pathological conditions in which it originates. Nevertheless, it is highly important as a sign, sometimes the first or almost only very obvious sign of serious diseases, which, but for it, might long escape observation. Whenever it occurs, therefore, it should lead to a close investigation of the various organs connected with the urinary apparatus by function or position, and especially of the kidneys and prostate. The urine should always be examined; as its condition may lead to important discoveries in relation to renal disease. The urethra too should be examined, in order that it may be ascertained whether a stricture exists, which might alone explain the symptoms.

But the affection to which the name of *irritable bladder* should be confined, as expressive of a distinct disease, is that last mentioned in the above list; viz., an increased susceptibility which renders it morbidly and even painfully impressible by healthy urine, or other natural and wholesome stimulus. This is often a purely nervous complaint, connected sometimes with debility, sometimes with hysteria, and sometimes with a disordered condition of the brain, spinal marrow, or other nervous centre. It may be merely the first step towards inflammation of the bladder, and dependent on the various causes of that affection, acting in a less degree, or upon a less impressible system. (See *Cystitis.*) It is, in general, distinguishable from other affections by the healthy state of the urine, and by the absence of fever, of pain or tenderness in the region of the bladder, of the symptoms of stone, of stricture of the urethra, and of other signs indicative of organic renal or cystic disease.

In the treatment of this idiopathic irritability, it is necessary to consult the state of the system. If the patient is robust and plethoric, the loss of a little blood, a dose of sulphate of magnesia, the warm bath, and an antiphlogistic regimen, employed separately in different cases, or altogether, as the grade of symptoms may require, will generally remove the complaint, and probably prevent the development of acute or chronic cystitis. Should the affection be painful, an anodyne enema may be administered; and advantage may accrue from the use of extract of belladonna in the more chronic cases. Injection of carbonic acid gas into the vagina has been recommended in obstinate cases of irritable bladder in women. Its first effect may be to irritate, but ultimately it acts as an anæsthetic. Mr. Henry Thompson has obtained beneficial effects in various forms of irritable bladder from *triticum repens*, given in the form of infusion, made with an ounce of the dried stem and a pint of boiling water, and administered in the quantity of half a pint or a pint, in divided doses, in 24 hours. (See *Am. J. of Med. Sci.*, Jan. 1862, p. 217.) Citrate of ammonia has been employed with great advantage by Mr. R. H. Meade, of Bradford, England, in cases connected with albuminuria, and the absence of a due amount of urea in the urine. He gives it by mixing a drachm of carbonate of ammonia with 75 grains of citric acid, and six fluidounces of water, and exhibiting a fluidounce of the solution three or four times a day. (*Med. T. & Gaz.*, July, 1863, p. 87.) The patient should drink freely of mucilages, and the bowels should be kept loose, though all aloetic or stimulating cathartics should be avoided, and only the mildest laxatives employed. If the complaint is connected with debility, mild tonics and astringents may be used, such as uva ursi, pipsissewa, pareira brava, the simple bitters, the mineral acids, and the tincture of the chloride or the solution of the iodide of iron. Occasionally, when there is no pain, the more stimulating diuretics are advisable, as buchu, the balsams, the turpentines, wild carrot, &c. The occasional use of local or general cold bathing or the shower-bath will also be advantageous. In hysterical cases, antispasmodics may be conjoined with the other remedies. Counter-irritation to the spine is sometimes useful.

5. Paralysis, or Debility of the Bladder.—It often happens that, from the want of due sensibility or muscular power, the bladder is unable to perform its office, or performs it but imperfectly. The symptoms vary with the part affected. When the neck of the bladder is exclusively concerned, incontinence of urine results. If the bladder in general is affected, we have retention of urine, in consequence of insensibility to its presence, or inability to contract upon it. These conditions may exist in very different degrees, from mere nocturnal incontinence on the one hand, or slight difficulty of micturition on the other, up to a constant flow of urine from inability to retain it, or a degree of retention sufficient greatly to distend the bladder, and endanger life. There is seldom, however, complete retention, the urine escaping in small portions, by an involuntary stillicidium, especially when the patient sleeps, and thus giving rise to very great inconvenience.

This partial or complete palsy may arise from a direct diminution of nervous energy, as in the gradual decay of strength incident to old age, and in spinal and cerebral disease, producing palsy elsewhere as well as in the bladder; or it may come on as a result of excessive or long-continued excitement, as from venereal excesses, or those organic diseases of the kidneys, prostate, &c. which sustain an incessant irritation of the bladder, exhausting at once its sensibility and power. In low fevers, this condition of the bladder is a not unfrequent concomitant of the general diminution of nervous energy. It occurs, also, occasionally in hysteria, as a consequence of the irregular distribution of nervous influence characteristic of that complaint.

When the affection depends upon cerebral or spinal lesion, or upon organic complaints of the urinary apparatus, it must be remedied, if at all, by addressing our measures to the real seat of disease. When the consequence of excessive indulgences, it can be relieved only by a change of habits. In cases associated with general debility, the vegetable tonics, the chalybeates, and the mineral acids, with the cold bath, are the appropriate remedies. Stimulation of the bladder by medicines having a tendency to the pelvic viscera, such as oil of turpentine and cantharides, or by electricity, will sometimes be of great utility in cases in which the affection is purely local. The induction apparatus is that best adapted to the application of electricity; and the most effectual means of operating is, we are told, the introduction of one pole into the rectum, and the other into the bladder. Care should be taken that the current be moderate and not much prolonged, so as not to exhaust the remaining nervous power by over-excitation. (Petrequin, *Bulletin de l'Académie*, xxiv. 928.) Strychnia, or some other preparation of nux vomica, is strongly indicated. Hysterical cases must be treated by the means applicable to the same kind of disorder elsewhere. It often happens that much may be done, in restoring power to the bladder, by inducing the patient to exert his own will vigorously. This is especially true in hysteria, in which a diseased will has often much to do with the complaint. In such cases, caution must be used not to resort too hastily or too freely to the catheter; but, generally speaking, in this disease, it is of great importance not to allow the bladder to become unduly distended; and to prevent this, it is necessary frequently to draw off the urine.

6. Strangury.—Perhaps this should be considered rather in the light of a symptom than a disease. There is, however, a more or less general irritation of the urinary passages, which is short of inflammation, and cannot, perhaps, be more appropriately designated than by this term. It is exhibited in a frequent and irresistible desire to pass water, of which very little escapes, with burning and cutting pains at the neck of the bladder, along the urethra, and at the end of the penis, during and immediately after the passage. The pains often extend to the bladder, up the ureters, and even into the kidneys themselves; and sometimes the rectum becomes involved, and tenesmus is induced. The symptoms are those of inflammation of the whole urinary passages; but the affection is often so transient, and yields so immediately to suitable remedies, that it can hardly be considered of that character. It is caused, most frequently, by irritating substances in the urine, and is a common attendant on the different forms of lithiasis. The most frequent cause of it, however, is the Spanish fly, either taken internally, or applied as an epispastic. As resulting from this cause, it is often most exquisitely painful. Oil of turpentine and other stimulating diuretics sometimes have the same effect.

The treatment is very simple. After the removal of the cause so far as possible, an injection of from forty to sixty drops of laudanum in a wineglassful of mucilage will almost always afford complete relief, if not at first, at least upon being repeated. As an auxiliary measure, mucilaginous drinks should be given freely. In mild cases, it may be sufficient to employ these with moderate doses of camphor in the form of camphor-water. Warm fomentations, emollient poultices, and the warm bath or half-bath may also be used; and should any objection exist to opiate enemata, other narcotics may be substituted, though none are so effectual.

2. *Disorders of Secretion or Excretion.*

The kidneys are undoubtedly emunctories, by which injurious substances accidentally present in the circulation, effete matters resulting from the perpetual renewal of the organization, and any excess in the wholesome principles of the blood, are thrown off from the system, and thus prevented from interfering with its healthy actions. It has been generally supposed that in performing this office, while they permit the passage of certain substances with little or no change, as water, urea, and various salts, they occasionally decompose others, and eliminate the results of this decomposition in new forms of matter, probably not pre-existent in the body. The substances, however, found at any time in normal urine, have been so almost universally found also in the blood, or in one or more of the organs of the body, that the idea is now beginning to prevail, that the kidneys are exclusively emunctories, and that there is no one of the urinary constituents which is not derived immediately from the blood. From this view of the function of the kidneys, it is obvious that the urine may vary greatly, both in quantity and constitution, not only in different individuals, but even in the same individual under different circumstances, and yet still remain within the limits of health. Thus, it is more or less copious according to the quantity of liquid drank, and the state of other emunctories, especially of the skin. One of the most important offices

kidneys is to preserve the amount of fluid in the blood in due propor-
the wants of the system. The quantity of urine will, therefore, be
ed with an excess in this proportion, and diminished with a deficiency.
uently, other things being equal, the individual who drinks more largely
other will pass a greater amount of urine in the same time; and the same
ce will be observed in the same individual at different times, according
habits in this respect. Again, the urinary and perspiratory functions are
ted that, when one is unusually active, the other is, in general, propor-
y inert, and whatever promotes or impedes the one has an opposite ef-
on the other. Hence, the urine is more copious in winter than in sum-
fter the use of cold than of hot drinks, and during the day than when
tient is warm in bed. The amount of pulmonary exhalation and of the
rge by stool also affects the quantity of urine, which is diminished as
mer is increased, and *vice versa*.

quality of the urine is not less various than its quantity. A full rich
animal food, supplying more nutriment to the blood than the wants of
nomy require, is attended with an excess of the solid ingredients of
ne; while a purely vegetable diet, which leaves the blood somewhat
nt, necessitates a diminished elimination of nutritive matter, and pro-
consequently, an opposite state of the secretion. The urine immedi-
ollowing a meal in which liquids have been taken freely, has long been
l to be very different from that which occurs after digestion has been
plished, and the rich chyle is poured into the circulation. The former,
mes called *urina potûs*, is abundant and watery; the latter, denominated
sanguinis, is moderate in quantity, but loaded with solid matters. Some
ation of this nomenclature has been proposed; the name of *urina cibi*
li being given to that following digestion after a full meal; and that of
sanguinis confined to the morning urine, which is not directly influ-
by food or drink. Whatever promotes activity in the general organic
ses of the system, as vigorous exercise, for example, and whatever ren-
necessary that the system should live upon itself, as starvation and fe-
liseases, promote a loaded condition of the urine, because the effete
s are in proportion to the activity of the organic changes. Even the
g urine, which upon the whole may be considered as offering the truest
on of the normal state of the function, because least interfered with by
ing causes, is more or less diversified in character. Generally speak-
examination of the urine, it is best to mix that passed in the morn-
th what is passed at other times of the day, so as to be able to make a
timate of its average quality.

redients not ordinarily existing in the urine are occasionally added to it,
equence of the use of certain articles of food or drink. Thus, aspa-
horseradish, and garlic impart to it peculiar odorous principles; and
rine matter and oxalic acid are asserted to have been found in it, after
use of sugar in the one case, and of sorrel or rhubarb pies in the other.
foreign impregnations cannot be considered morbid, unless productive
e injury in the economy. On the contrary, their presence is probably
ult of a preservative process.

ollows, from what has been said, that it is impossible to indicate any
condition of the urine, whether as to amount or quality, which can be
ered as the healthy standard. All that can be done is to make some ap-
ation to such a result. It is not surprising that very different opinions
een given by writers. The conclusions here presented are those which
ppeared to the author most probable, after a comparison of the various
ents upon the subject.

elation to the quantity of urine passed daily, the mean for a healthy man, in temperate weather, and without the operation of any extraordinary causes, may be stated at two or three pints. Women generally pass less, because less active and more abstemious, and children more in relation to the weight of the body.

The density of the urine, which indicates, though somewhat indefinitely, the proportion of its solid ingredients, is exceedingly variable, being sometimes as low as 1·005, sometimes as high as 1·033; and both these points may be passed in their respective directions, without a necessary deviation from health. Prout, in the last edition of his work on renal diseases, states the average specific gravity at from 1·015 in summer to 1·025 in winter. Willis thinks that the general average is for adults about 1·015, and, if children are included, 1·012. Dr. Gregory gives, as the result of numerous observations, 1·0225; and Dr. Christison considers even this too low, and places the average for a robust healthy man of moderate habits at 1·0252. But it is obvious that the results obtained by different investigators must vary according to the habits of the people among whom they live. The density would be much greater with a population living chiefly on meat than with another whose diet is exclusively vegetable. In pregnancy the normal sp. gr. is higher, and may be as high as 1·033 without deviation from health. In febrile and inflammatory diseases the sp. gr. is above the normal standard; in diseases of debility is often, though by no means invariably, below it.

The quantity of the urine, or its density, affords alone no indication of the loss of solid matter to the system, which is often an important problem to solve. The urine may be very copious, and yet contain so little solid matter as to abstract less than the ordinary average from the blood; or it may be very dense, and yet so small in amount as to lead to the same result. To come at the truth, the density and quantity must be considered together. In the healthy state, a diminished density is usually compensated by an increased quantity, and *vice versa*, so that the average of solid matters daily discharged is about the same, whatever may be the amount of urine. This average is, according to Christison, under the most favourable circumstances, nearly two ounces and a half, and is seldom short of one ounce and a half, which ought, therefore, to be the daily yield of urine.*

The constituents of healthy urine are usually water; urea; colouring and extractive matters; uric acid, hippuric acid, and lactic acid, with their salts; the compounds of phosphoric, sulphuric, and perhaps oxalic acids, with ammonia, potassa, soda, lime, and magnesia; chloride of sodium and other chlorides; and iron as an ingredient of the colouring matter. Berzelius found also a minute proportion of silica, and traces of fluoride of calcium. A little mucus is usually present, derived from the membrane lining the urinary passages. Fatty and resinous matters are probably among the ingredients of normal urine, and some chemists maintain that sugar always exists in it in very small proportion. Besides the acids mentioned, malic and phenylic among the organic acids, and carbonic and nitric among the inorganic, are occasionally present, free or combined, without necessarily implying an unhealthy state of the secretion; and the same may be said even of albumen. Creatin and creatinin, two nitrogenous principles, supposed to result from the nutritive disintegration of muscular tissue, have been detected in the urine, and probably form frequent constituents of it, though yet little known in their pathological relations. These several ingredients may vary greatly in proportion without deviation from health, so that no one analysis of urine can be expected to agree exactly with another. The table given in the note, and taken from Prout's work on Urinary Diseases, exhibits the results of carefully conducted analyses.* In the healthy

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* The quantity varies with the habits of the individual, and is different in different nations, according to their usages as regards diet, exercise, &c. The statement of Christison, as given in the text, may be considered as referring to the people of Scotland. The German average according to Lehman, is 1051·21 grains, or very nearly the same as the Scotch; the French, according to Becquerel, is 612·56; the English, according to Harley, is 821·50 (*Med. T. & Gaz.*, Feb. 1864, p. 195); and these results correspond with what is known of the habits of these several people. The American ought to exceed the highest here given; as certainly there is no civilized people, which, as regards the whole population, consume so much animal food as the inhabitants of the United States. Men excrete more solid matters than women, unless the latter be in the pregnant state, and children more proportionably than adults. The best method of determining precisely the proportion of solids is carefully to evaporate a given measure of urine in a glass capsule, taking care not to use a decomposing temperature, and weighing the residue. For practical purposes the sp. gr. will generally answer. (*Note to the sixth edition.*)

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* Table, *representing in English weights and measures the mean normal Quantity, Specific Gravity, and Composition of the Urine, in the different Sexes, as deduced from eight analyses (four in each sex) by M. Alfred Becquerel.* (*Semeiotique des Urines*, p. 7.)†

Quantity, Specific Gravity, and Composition of the Urine.		Male.		Female.		General Mean.	
		Urine in 24 hrs.	Composition of 1000 parts.	Urine in 24 hrs.	Composition of 1000 parts.	Urine in 24 hrs.	Composition of 1000 parts.
Quantity of urine		44 fl. oz.	1000·000	48 fl. oz.	1000·000	46 fl. oz.	1000·000
Specific gravity of urine		1018·9		1015·12		1017·01	
General Composition	Water ... grs.	18949·6	968·815	20642·8	975·052	19796·2	971·935
	Solid matters ... grs.	609·9	31·185	528·0	24·948	568·9	28·066
Details of Analysis.	Water	18949·6	968·815	20642·8	975·052	19796·2	971·935
	Urea	270·7	13·838	240·4	10·366	255·5	12·102
	Lithic acid (uric acid)	7·6	0·391	8·6	0·406	8·1	0·398
	Organic matters inseparable from each other. { Lactic acid Lactate of ammonia Colouring matters Extractive matters Muriate of ammonia }	181·1	9·261	149·0	8·033	165·0	8·647
	Fixed salts indecomposable at a red heat. } Chlorides Phosphates Sulphates { Lime Soda Potash Magnesia }	150·5	7·695	130·0	6·143	*a* 140·3	*b* 6·918
		19659·5	1000·000	21170·8	1000·000	20365·1	1000·000

† 15·434 grs. Troy = 1 gramme; 437·5 grs. Troy = 1 fl. oz. of water. I have omitted the fractions of the fl. oz. as of no importance to the general statement.

Composition of the entire quantity of fixed salts voided in 24 hours; and in 1000 parts of urine.

a Fixed salts voided in 24 hours.	
Chlorine	10·17
Sulphuric acid	17·38
Phosphoric acid	6·44
Potash	26·36
Soda Lime Magnesia	79·97
	140·27

b Fixed salts in 1000 parts.	
Chlorine	·502
Sulphuric acid	·655
Phosphoric acid	·317
Potash	1·300
Soda Lime Magnesia	3·944
	6·918

Composition of the Urine. Since the above table was prepared, there has been considerable advance in our knowledge of the constitution of the urine, and some modifications will be necessary of the statements therein contained. I propose to give, in this place, a general account of the ingredients of normal urine, derived from the most recent authorities, confining myself, however, mainly to points of practical importance, and referring for further information to the published works of Parkes, Hassall, Beale, Thudichum, Harley, and others.

Water.—This has been considered in the text. One additional fact, however, of some importance is, that the water, in its elimination from the blood, carries a certain amount of solids with it, beyond what the mere necessary metamorphosis of the tissues would require. Thus, by increasing the quantity of water taken as drink, the amount of solids excreted by the kidneys is also increased; as if the presence of this excess of water in the state, the urine has generally an acid reaction, indicated by the reddening of litmus paper. The peculiar colour of healthy urine depends upon a special co-

circulation accelerated metamorphosis, or by its solvent powers over the products of digestion caused a portion of these to escape, which might otherwise have been retained. A practical inference from this fact is that the free use of water as drink may co-operate with other measures in reducing morbid obesity.

Urea.—This is the most characteristic, and probably most important constituent of urine. It is a solid, crystallizable, colourless body, fusible, inflammable, soluble in water and in alcohol, but insoluble in ether. Its formula is $C_2H_4N_2O_2$, and equivalent 60. Though decomposed by most of the strong acids, it combines with nitric and oxalic acids to form crystalline compounds. Its existence in the urine may be tested by means of nitric acid. If to normal urine, reduced one-half by evaporation, strong nitric acid be added in considerable excess, crystallization will take place; the urine having been apparently converted into a mass of crystals. When the urine is abnormally loaded with urea, the same phenomenon is observed on the addition of the acid, without previous concentration. Thus, a great excess of urea may be detected by a very simple measure: and the quantity of urea may be roughly estimated by ascertaining the weight of the nitrate formed, which will contain an equivalent of urea for each equiv. of the monohydrated acid. The nitrate, when rapidly crystallized, is in flat, rhomboidal, shining plates; when slowly, in delicate prisms. The salt, though freely soluble in water, is but sparingly so with an excess of the acid. In the presence of organic nitrogenous matter, it undergoes, when exposed to the air, a fermentation, by which it is converted partially into carbonate of ammonia. Hence the putrefaction of urine on exposure, with the exhalation of an ammoniacal odour. It is undoubtedly a pure excretion, being merely separated by the kidneys from the blood. It always exists normally in that fluid, in proportions variously stated from 0·016 to 0·320 per cent. in health; but the latter is certainly an extreme amount. As in the case of the solid ingredients of the urine generally, it is excreted more largely by men than women, and by children than adults. The daily amount is liable to great variation. The average quantity in an adult man may be stated at somewhat more than an ounce. It is greatest with an exclusively animal diet, and least with one consisting of non-nitrogenous vegetable food, as starchy, saccharine, and mucilaginous substances. Von Franque, experimenting on himself, found the mean result, 1416 grains in 24 hours from animal food: 573 from a mixed diet; 434 from vegetable food generally and 248 from an exclusively non-nitrogenous diet. (*Med. T. & Gaz.*, April, 1864, p. 418.) It is also increased by exercise. That it proceeds partly from the normally disintegrated tissues is proved by the fact, that starving animals continue to excrete it with the urine. Some suppose that it is exclusively from this source; but there is now no doubt that it also proceeds from the food, and thus has a double origin. It is possible that a portion of that excreted may result from the conversion of uric acid. Various substances used habitually for drink, as alcoholic beverages, tea, and coffee, are thought to have some influence over the amount of urea excreted; and some practical inferences have been drawn from the results obtained, in reference to the acceleration or retardation of the metamorphosis of the tissues by these substances. Thus from the experiments of Böcker and Lehmann, confirmed by Hammond, coffee and tea are supposed to diminish the excretion of urea, and thus to retard the tissue-changes. But this inference is founded on the assumption that the urea proceeds only from this cause; when, as is now known, it proceeds also from food; and thus all such conclusions are vitiated. Besides, the experiments themselves, as to the influence of those substances, are yet insufficient to justify absolute conclusions. Thus, Dr. Harley has found coffee to increase the excretion of urea; and ascribes the contrary result of Böcker and Hammond to the probable use of sugar with their coffee. Saccharine, amylaceous, and fatty substances generally, containing no nitrogen, lessen the product of urea. The probability is, that matters of this kind take the nitrogen, which might otherwise pass off in urea, in order themselves to be converted into nitrogenous tissue. The excretion of urea is generally increased in febrile and inflammatory diseases; and in some affections, as in ureous diuresis, is so abundant as to form a prominent feature of the complaint; and the same may be said of its diminution in other affections, as Bright's disease.

Uric Acid.—Like the preceding ingredient of urine, this is highly characteristic, though, in consequence of its very sparing solubility, it probably does not often exist free in that fluid; being generally combined with ammonia, potassa, or soda, in the form of urate. It is, when pure, white, crystalline, tasteless, very feebly acid, very slightly soluble in water, and insoluble in alcohol or ether. Its crystals are of various forms, sometimes in plates diamond-shaped, roundish, oval, or square, sometimes in rods, and often in bundles of needles. Its formula is $C_{10}H_4N_4O_6$, and equivalent 168. By heat it is decomposed, yielding, among other products, urea and carbonate of ammonia. It is recognised by yielding

ing principle, closely analogous in composition to the hæmatin of the red
uscles, and no doubt derived from them, for which Dr. Geo. Harley proposes

utiful purplish substance, named *murexide*, when submitted to the action first of nitric
and then of ammonia. It may be extracted from urine, and its quantity estimated,
dding to 100 measures of urine 10 of strong muriatic acid, stirring the mixture, and
g it aside to crystallize. The muriatic acid separates the uric acid from the bases
h hold it in solution; and the latter acid, being nearly insoluble, is deposited in crys-
These are to be collected on a filter, washed with alcohol mixed with a little muriatic
then dried and weighed. In the form of urate, it exists in the urine of carnivorous and
vorous animals, but not in that of the herbivorous. The proportion in the urine varies
the diet. The mean quantity passed in 24 hours is, according to Lehmann, 22·9 grains
an animal diet, 18·3 from a mixed, 15·8 from a vegetable, and 11·8 from a diet of
nitrogenous substances. This, like urea, appears to be influenced by national peculi-
s, the Germans having most, the French least, and the English an intermediate
tity. The urine of infants at the breast is said not to contain it. Much more is ex-
d in cold than in warm weather. The stronger wines and malt liquors are said to
ase the excretion of uric acid, coffee and tea to diminish it. It is said to be increased
flammatory disease, in those of the liver, and in fevers generally, except yellow and
ttent fevers, in which it is diminished. It is also lessened in diabetes, cholera, chlorosis,
ysteria. It is sometimes eliminated by the lungs and skin. (Harley, *Med. T. & Gaz.*,
, 1864, p. 610.) It is augmented after severe and protracted muscular exertion, hard
, and under the influence of fear. (*Ibid.*, May, p. 584.) According to Hammond, how-
it is greatly diminished by exercise. (*Am. J. of Med. Sci.*, Jan. 1855, p. 122.) It exists
e blood in very small proportions in health, and has been found in various tissues
e body. The probability is that, like urea, it originates partly in the decomposition
e nitrogenous tissues, and partly in that of the excess of the protein articles of diet.
e salts of uric acid, the urate of soda appears to exist, contrary to what was formerly
osed, in larger proportion in urine than the urate of ammonia, which it exceeds in
ility. Uric acid and its compounds have a great affinity for the colouring matter
e urine, and, though themselves white or colourless, are usually deeply stained with
when from any cause deposited by the urine. As regards the pathological relations
ic acid, which are highly important, all that is essential will be found under the spe-
diseases in which it is concerned, especially gout and uric acid lithiasis.

ppuric *Acid.*—Though long known to exist in the urine of herbivorous animals, and
tained not long since to be produced in that of man by the taking of benzoic acid,
s not till the comparatively recent experiments of Weissmann, that it was shown to
normal ingredient in human urine. This acid is solid, white, crystallizable, of an
reaction with litmus, freely soluble in water, and soluble also in alcohol and ether.
ually crystallizes in rhombic prisms, or in long fine needles, often joined in dove-
orm. Its formula is $C_{18}H_9NO_6$, and equivalent 179. By fermentation it is converted
benzoic acid, and is, therefore, not easily found in stale urine. That it was not
r recognized as an ordinary ingredient in urine was probably owing to its absence
the deposits, in consequence of its great solubility in that liquid. When precipitated
uric acid, on the addition of muriatic acid to urine, it may be obtained separate by
lving it out of the mixture by ether containing 10 per cent. of absolute alcohol. Un-
mixed diet, 33·6 grains are said to be excreted in 24 hours; but with a purely ani-
diet, only 11·8 grains; and the largest product is said to be yielded by a purely vege-
diet. Certain fruits, such as cranberries and plums, yield it largely. It is said to
creased in diabetes and febrile diseases generally, and, according to Parkes, in cho-
Benzoic acid and the balsams increase it. When taken into the stomach, it passes
anged with the urine.

louring matter.—Urohæmatin* (Harley).—*Uroxanthin* (Heller).—Little was known pre-
y in relation to the colouring principles of urine until the experiments of Heller,
, though he did not isolate the principle, demonstrated its existence in urine, and
it the name of uroxanthin. He supposed it, however, on insufficient grounds, to
ist of two distinct substances, to which, accordingly, he gave distinct names. Sche-
was the first to separate the principle, though in an impure state, from the urine,
found it so analogous to the hæmatin of the blood, that he referred its origin to the
corpuscles. Dr. Harley afterwards obtained it quite pure, and, on investigating its
erties and composition, and finding it in both respects closely analogous to hæma-
concluded that it was a derivative from that principle, and named it, in accordance
this view, *urohæmatin*. As described by Dr. Harley it is an amorphous, bright-red
tance, so soft when freshly prepared as to receive the impression of the nail, but
me becoming hard and somewhat brittle, with a glistening fracture, somewhat re-
bling dark-red sealing-wax. It seems to be unchanged by exposure, retaining its fine

the name of *urohæmatin;* and the variable intensity of the colour depends on the proportion of this principle to the water of the urine. Even very high-

red tint unimpaired for a long time, perhaps indefinitely. It is readily soluble in alcohol, ether, and chloroform, imparting to those liquids a fine port-wine colour, varying with the strength of the solution. It is also soluble in urine, but is insoluble in pure water, or in solution of chloride of sodium. It is also insoluble in the acids, even the strongest, but is readily dissolved by solutions of the caustic alkalies. In all these respects it agrees with hæmatin, which it resembles also in its composition, even to the containing of iron. To obtain it, evaporate urine to the consistence of molasses, removing the salts as they crystallize, then extract the colouring matter with alcohol, and, having boiled the coloured solution with slaked lime till deprived of colour, dry the compound of lime and colouring matter thus obtained, wash it successively with water and ether, then treat it with hydrochloric acid, and extract the colouring matter thus separated by means of alcohol. The alcoholic solution is now mixed with an equal measure of ether; and the mixture, having stood for a day or two, is to be treated with water, which separates the ethereal solution. This is to be removed and evaporated, and the residue submitted to the action of chloroform, which dissolves the pure colouring matter, and yields it on evaporation. Urohæmatin is excreted in variable proportion to the water, so that urine may have but a slight tint from it, or be as dark almost as port wine. It is undoubtedly derived in great measure from the red corpuscles, and the quantity in some degree measures the extent of the destruction of these corpuscles; yet it must be borne in mind that the colour of the urine is not to be considered as a test of this quantity; for the bulk of water excreted may be so great as to counteract the colouring effect of the hæmatin. Thus, there may be two patients, both passing large quantities of nearly colourless urine; one of whom may be in no degree seriously affected, while the other may be rapidly wasting away with the loss of red corpuscles. The addition of nitric acid will show the difference, producing no observable effect on the one urine, but developing a deep-red colour with the other. In the one there is little of the colouring matter, in the other much, held in solution by a combination from which the acid separates it. According to Dr. Harley, the urohæmatin is in small part derived from the food, very little from that of animal origin, but more largely from vegetable diet. (*Med. T. & Gaz*, Aug. 1864, p. 218.)

Phosphoric Acid and the Phosphates.—Phosphorus does not exist uncombined, in the normal state, either in the body, or any of the secretions or excretions. But in the form of phosphoric acid, combined with alkaline and earthy bases, it is a constant ingredient in healthy urine, in which its insoluble salts are held in solution by the acids present. The deposition of these salts is an evidence of an abnormal condition of the urine which can no longer hold them in solution, or of the system by which they are too largely produced. But whatever concerns them pathologically will be more conveniently treated of under the head of *phosphatic lithiasis*, or of other diseases in which they are abnormally present. In this place, it is sufficient to state that, while a portion of the phosphates in the urine originates in the food, the larger part probably results from the metamorphosis of the tissues, especially the nervous tissue, whether cerebral or spinal, which contains phosphorus among its constituents, and by the oxidation of that substance in its functional action and nutritive changes, yields phosphoric acid to the blood, where it finds the various bases with which it combines. Now such of these salts as are soluble in water, as those of potassa, soda, and ammonia, remain dissolved in the urine, while the earthy salts, being insoluble, unless aided by an excess of acid, are occasionally precipitated, and thus occasion a variety of gravel or calculus. It is only these which are important, except in so far as the amount of the phosphates, both soluble and insoluble, in the urine may measure the degree of metamorphosis in the tissues, and especially the nervous. In this respect, it might be desirable to estimate the quantity of phosphoric acid eliminated with the urine. Its production is said to be diminished in many febrile and inflammatory diseases, but, in active diseases of the nervous tissues, whether in the brain or spinal column, it is often greatly increased. The phosphates in the urine are increased in rickets, especially phosphate of lime, and lessened in Bright's disease.

Considering the opposite conditions of the urine, by which the urates and phosphates are respectively held in solution, the former being better retained when it is alkaline, the latter when it is acid, it may seem strange that the two should sometimes be found in the same urinary deposit. But it may be explained by the circumstance that the urates may be thrown down in the fresh urine when it cools, as will always happen when the liquid is saturated at the time of its discharge, while the phosphates are afterwards deposited when the urine has become somewhat alkaline by decomposition, but not sufficiently so to effect a re-solution of the precipitated urates.

The average quantity of phosphoric acid daily eliminated with the urine by a healthy adult is stated at 50 grains. In infants the proportion is relatively larger, probably in coloured urine may owe this property exclusively to its relative excess. Fresh urine has a characteristic odour, which is peculiar for the most part in each species of animal, and in man is somewhat aromatic, and entirely distinct from that which is observable after exposure for some hours, and which arises from decomposition. The taste is saline and bitterish. Though urine in health has usually an acid reaction, it is always changing in the degree of its acidity, which, according to Dr. H. Bence Jones, is greatest before eating, and diminishes immediately after, especially when animal food is eaten, in which case it may even become alkaline. This seems to be owing to the concentration of acid in the stomach during digestion, and its consequent diversion from the kidneys. The acidity of urine was formerly in general ascribed mainly to uric

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consequence of their diet, of which milk, which is rich in phosphates, constitutes usually a large part. The presence of phosphoric acid may be ascertained by adding to the urine a little acetate of soda, with a very little acetic acid, and then dropping into it a solution of sesquichloride of iron. If the acid be present, phosphate of iron will be precipitated in a gelatineous form. To estimate the quantity of phosphatic salts sufficiently for practical purposes, add to a given portion of urine ammonia, in order to precipitate the earthy phosphates, then filter, and add to the clear liquid sulphate of magnesia and a little carbonate of ammonia, when the remaining phosphoric acid will be precipitated in the form of triple phosphate of magnesia and ammonia. The two precipitates are to be dried and weighed. The result will be the weight of the phosphates.

Lactic acid requires no special consideration, as its pathological relations in the urine are not well determined, other than such as are connected simply with its acidity, by which it assists in giving to the urine its normal solvent properties.

Oxalic Acid and the Oxalates will be considered under oxaluria.

Sulphuric Acid and the Sulphates are of little pathological importance, and, when interested in any special disease, will be treated of in connection with it. As all the sulphates in the urine are soluble, even the sulphate of lime to a considerable extent, they are not apt to be troublesome as the cause of calculous affections.

Chlorine and the Chlorides.—Though chlorine may exist in the urine in combination with all the metallic radicals found in that secretion, it is the chloride of sodium which is chiefly interesting to the physiologist. Common salt is an essential constituent of the system, but, like its other components, is occasionally liable to be present in excess, and may thus prove injurious to the health. The kidneys, however, serve as emunctories, by which this compound escapes when superabundant, and they thus serve to maintain the due equilibrium in the circulation. The presence of chlorine in the urine may be detected by the addition of nitrate of silver; and its quantity ascertained by collecting and weighing the chloride of silver, the chlorine equivalent of which will give the weight required. The amount of chlorides excreted by the kidneys is considerably less than the quantity of common salt taken into the stomach. This is owing partly to a consumption of the chloride in the performance of the healthy functions; the chlorine probably contributing the muriatic acid necessary to impart its full solvent powers to the gastric juice, while the sodium probably goes to aid in the formation of bile; but is also owing to the escape of the salt by perspiration and with other excretions, of which it generally forms a part. The daily amount of chlorine excreted in health varies extremely; and the mean is also variously stated by different writers; the average amount, as given by Parkes, from a comparison of numerous authorities, being 126·76 grains; while others give a much less quantity, and Harley considers the average for an Englishman as 77·5 grains. It varies also still more in disease. While said to be increased in the cold and hot stage of intermittents, it is greatly diminished in acute inflammations with plastic exudation; and in pneumonia, during the stage of red hepatization, it almost or entirely disappears, to return when absorption begins to take place. It is said also to be absent or diminished in typhus and typhoid fevers, purulent infection, phthisis, and cholera. The pathological relations, however, of its variable presence in the urine are so little understood, that, except in regard to plastic inflammatory diseases, in which its absence may indicate the existence of exudation, and its returning presence the commencement of absorption, little practical advantage can be taken of our knowledge on the subject. It is possible that in great excess it may render the urine irritating to the mucous membrane of the urinary passages; and, in the want of another discoverable cause for irritation of these passages, it might be proper to examine the urine in order to ascertain whether there might not be an excess of the chlorides.

It is due to Dr. Geo. Harley to state that for much of what is contained in this note I am indebted to his very interesting lectures, published in the *Medical Times and Gazette* during the year 1864. (*Note to the sixth edition.*)

to name *oodo urinarius*, and which, when living and in motion, appears oval or rounded, and granular, somewhat like mucous corpuscles. The two often appear together, but may also exist separately. Of course, it is only in urine which has been exposed to the air that they are developed. Their chief importance pathologically is to call attention to the fact that the urine is alkaline, and to suggest that it might be otherwise abnormal, albuminous for example, and thus to lead to further investigation. (*Lancet*, Nov. 1859, p. 503.) *Sugar* in the urine, which is a characteristic of true diabetes, is often of fatal significance. This affection will be fully treated of in the following pages. *Oil* is an occasional ingredient of morbid urine. It is generally in the form of an emulsion, combined with albuminous or fibrinous matter, and giving a milky appearance to the secretion. In some instances it is found in considerable quantities, even floating in distinct globules upon the surface. Except as it occurs in Bright's disease, it does not appear to be associated with any special recognized disease, and probably depends on the abnormal presence of oily matter in the blood. It is owing to such an impregnation of the urine that it has been sometimes supposed to contain milk. Rayer never could detect the milk globule in the urine, except in one instance, in which it was obvious that milk had been added to it. Starch granules have been found in the urine, but their presence was accidental or fraudulent. *Fibrin*, in connection with oil and albumen, is in some rare cases so abundant as to render the urine spontaneously coagulable. This is the case in the *chylo-serous* urine of Dr. Prout, which, as it scarcely rises to the rank of a distinct disease, and is too obscurely connected with any known derangement of system to be attached as a symptom to any other disease, will be most conveniently considered in this place, as an occasional derangement of the *urine*.

Chylo-serous urine (Prout), *oleo-albuminous urine* (Willis), or *chylous diuresis* (Venables), is a curious and rare affection, first described minutely by Dr. Prout, but subsequently noticed by various writers. The characteristic qualities of the urine are a whitish or milky opacity, and spontaneous coagulability. The milkiness varies in different specimens from a mere opalescence to perfect opacity; and the amount of coagulum is proportionate, being small in the former case, while in the latter it occupies the whole bulk of the urine, having the shape of the vessel, and an appearance not unlike that of blanc mange. When the coagulum is placed in a position favourable for draining, it separates into two portions, one a thin, opalescent, or whitish liquid, which upon standing becomes covered with a whitish creamy layer, and the other a fibrinous mass of small relative bulk, which is either whitish, or somewhat tinged by the colouring matter of the blood. Dr. Prout observed that the urine passed a few hours after a full meal, and when the chyle might be supposed to be entering the circulation, was quite opaque, while that passed after long abstinence was merely opalescent. Sometimes the milky urine is mixed with a good deal of blood, which gives it a red colour. If agitated with ether, it becomes transparent, at least in some instances; and the ethereal solution yields an oily or fatty matter on evaporation. It is to this oil, therefore, forming a white emulsion with the other matters, that the urine owes its milkiness. The liquid portion, remaining after the separation of the coagulum, is proved to be albuminous by coagulating with heat. The solid spontaneously coagulated portion is fibrin. Urea and the salts of the urine are found in the liquid, which does not materially vary in density from healthy urine.

This affection is sometimes attended with an increase of the urinary secretion, so great as to have induced some to rank the complaint with the different forms of diabetes. But this is not a necessary symptom. In severe cases, the patient is occasionally troubled with difficult micturition, in consequence of the coagulation of the urine in the bladder. There is sometimes uneasiness in the back and loins, with slight excitement of the circulation, a dryish and furred tongue, thirst, torpid bowels, and a dry skin; and occasionally the diabetic symptoms of extreme thirst and hunger, emaciation and debility, are presented. In other cases, little or no depravation of the general health is observed. The disease does not appear to be very dangerous; at least patients live long under it, and, when death has occurred, it has generally resulted from some other disease. In one instance, the patient died of exhaustion, after having had the complaint twenty years; in another, death took place in a shorter time from the same cause. The characteristic condition of the urine sometimes disappears spontaneously, and returns after a long interval. In several instances, recovery has taken place, and the patients have remained well up to the last period of inquiry. In the case of an individual affected with the disease who died of some other complaint, the kidneys were found healthy; and it was therefore supposed that the state of the urine does not depend on organic renal disease. Prout ascribes it to the production of an imperfect chyle, which does not readily become assimilated with the blood, and is, therefore, thrown off by the kidneys. But it is probable that the kidneys are also in fault, as the colouring matter of the blood not unfrequently escapes with the other principles. It is not necessary to resort to the chylous theory to explain thè phenomena. Oil is often found in the blood, which contains also albumen and fibrin; and these are the prominent constituents of the milky urine. A relaxation of the renal vessels such as to permit the passage of these constituents of the blood, without or with but little of the red corpuscles, is sufficient to account for the phenomena. In one of the fatal cases above referred to, which was under the care of Dr. Simpson, of Edinburgh, in 1855, the kidneys, though not apparently abnormal to the naked eye, were found, on microscopic examination, to have undergone fatty degeneration to a considerable extent, so that the tubular structure of the cortex could scarcely be recognized. The inference from this case is that the kidneys are in fault.

The causes of the complaint are obscure. Residence in a hot climate appears to predispose to it; for it is said to be much more frequent within the tropics than in temperate latitudes. In more than one-half the cases which came under the notice of Dr. Prout, the patients had either been born or had long lived in hot countries. Exposure to cold, extreme fatigue, luxurious living, and the action of mercury have been mentioned as exciting causes; and yet Prout states that, in one instance, he noticed the disappearance of the chylous symptoms during a severe mercurial ptyalism. The disease is confined to no particular age, and to neither sex. It is very rare. Only thirteen cases came under the notice of Dr. Prout, either in his own practice, or that of his professional friends.

The treatment is not well settled, and must, therefore, be left to the guidance of general principles. In the earlier stages, when there is some uneasiness in the region of the kidneys, and some general excitement, the lancet, cups to the back, and the antiphlogistic regimen may be expected to do good. The skin should be kept warm with flannel, and a tendency of the circulation to the surface promoted by the warm or vapour bath, aided by the powder of ipecacuanha and opium. In chronic cases, the digestive organs should be attended to, and their functions corrected if deranged. Astringents have been employed, but generally with no great advantage. In a case, however, reported by Dr. H. Bence Jones, the disease disappeared entirely for a considerable time under the use of gallic acid, given in the quantity of a drachm daily; and, though the affection returned subsequently on several occasions, it was each time benefited by the remedy. In the relapses of this case, Dr. Jones increased the quantity of the acid from twenty grains up to forty grains three times a day. Tannic acid was also tried, but produced disorder of sto-to name *vodo urinarius*, and which, when living and in motion, appears oval or rounded, and granular, somewhat like mucous corpuscles. The two often appear together, but may also exist separately. Of course, it is only in urine which has been exposed to the air that they are developed. Their chief importance pathologically is to call attention to the fact that the urine is alkaline, and to suggest that it might be otherwise abnormal, albuminous for example, and thus to lead to further investigation. (*Lancet*, Nov. 1859, p. 503.) *Sugar* in the urine, which is a characteristic of true diabetes, is often of fatal significance. This affection will be fully treated of in the following pages. *Oil* is an occasional ingredient of morbid urine. It is generally in the form of an emulsion, combined with albuminous or fibrinous matter, and giving a milky appearance to the secretion. In some instances it is found in considerable quantities, even floating in distinct globules upon the surface. Except as it occurs in Bright's disease, it does not appear to be associated with any special recognized disease, and probably depends on the abnormal presence of oily matter in the blood. It is owing to such an impregnation of the urine that it has been sometimes supposed to contain milk. Rayer never could detect the milk globule in the urine, except in one instance, in which it was obvious that milk had been added to it. Starch granules have been found in the urine, but their presence was accidental or fraudulent. *Fibrin*, in connection with oil and albumen, is in some rare cases so abundant as to render the urine spontaneously coagulable. This is the case in the *chylo-serous* urine of Dr. Prout, which, as it scarcely rises to the rank of a distinct disease, and is too obscurely connected with any known derangement of system to be attached as a symptom to any other disease, will be most conveniently considered in this place, as an occasional derangement of the *urine*.

Chylo-serous urine (Prout), *oleo-albuminous urine* (Willis), or *chylous diuresis* (Venables), is a curious and rare affection, first described minutely by Dr. Prout, but subsequently noticed by various writers. The characteristic qualities of the urine are a whitish or milky opacity, and spontaneous coagulability. The milkiness varies in different specimens from a mere opalescence to perfect opacity; and the amount of coagulum is proportionate, being small in the former case, while in the latter it occupies the whole bulk of the urine, having the shape of the vessel, and an appearance not unlike that of blanc mange. When the coagulum is placed in a position favourable for draining, it separates into two portions, one a thin, opalescent, or whitish liquid, which upon standing becomes covered with a whitish creamy layer, and the other a fibrinous mass of small relative bulk, which is either whitish, or somewhat tinged by the colouring matter of the blood. Dr. Prout observed that the urine passed a few hours after a full meal, and when the chyle might be supposed to be entering the circulation, was quite opaque, while that passed after long abstinence was merely opalescent. Sometimes the milky urine is mixed with a good deal of blood, which gives it a red colour. If agitated with ether, it becomes transparent, at least in some instances; and the ethereal solution yields an oily or fatty matter on evaporation. It is to this oil, therefore, forming a white emulsion with the other matters, that the urine owes its milkiness. The liquid portion, remaining after the separation of the coagulum, is proved to be albuminous by coagulating with heat. The solid spontaneously coagulated portion is fibrin. Urea and the salts of the urine are found in the liquid, which does not materially vary in density from healthy urine.

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The *extractive matters* of the blood are often eliminated by the kidneys, and, according to Dr. G. O. Rees, are always found in albuminous urine. Their presence is ascertained by first boiling the urine so as to coagulate all the albumen, and afterwards testing the clear liquid by tincture of galls, which throws down the extractive. They are also found in certain cases marked with debility, unattended with albuminuria, as in chlorotic anæmia, and anasarca with disease of the heart. The presence of extractive is important, as indicating a drain from the circulation, and will sometimes account for general debility and impoverished blood, the cause of which might otherwise be obscure. (*Med. Gaz.*, July 25, 1851.)

Creatin and *creatinin* have been mentioned as occasionally present in healthy urine. As they are among the results of normal muscular decomposition, and are purely excrementitious matters, they may be looked for in the urine after vigorous muscular exertion, and in all pathological conditions in which the muscles are especially wasted. They are both nitrogenous, crystallizable bodies; and creatinin, being probably a derivative of creatin, is said by Dr. Hassall to exist in the urine more largely than the latter principle, though creatin is obtained more copiously from muscle. For their chemical properties, and the method of separating them, I must content myself with referring to works on organic chemistry.

Bile, or its colouring principle, is very often present in urine, giving it a deep-yellow, yellowish-brown, or almost black colour. For an account of the circumstances under which this impregnation is most apt to occur, the reader is referred to the article on jaundice. A mode of detecting the presence of bilious colouring matter has been given under that head. Another, which may be mentioned here, is to pour some urine into a shallow white dish, and then to add nitric acid. If the colouring principle of bile be present, there will be a beautiful play of colours, among which the green, blue, pink, violet, and bright-yellow may be noticed. Dr. Hassall directs, as a very delicate test of bile in the urine, even when not visibly coloured by it, to set a portion aside for a few days, and to observe, by means of the microscope, the colour of the crystals of triple phosphate when deposited, as they are sure to be. If any bile is present, the crystals are deeply stained yellow, whereas they are colourless without bile. The same thing happens when the triple phosphate is deposited in recent urine. (*Lond. Lancet*, Am. ed., April, 1858, p. 293.)

Carbonate of ammonia is among the occasional abnormal ingredients of the urine. In this case the urine has an ammoniacal odour, and, upon the addition of an acid, will give out carbonic acid if heated. It appears that urea is sometimes changed, either in the blood, or by the chemical action of the kidneys, into carbonate of ammonia; for the former is often wanting when the latter is present. That the ammoniacal salt is not, in all cases, the result of a putrefactive process, is proved by the fact, that in low fevers, scurvy, &c. its presence has been detected in the urine immediately after secretion. It is true that, in certain chronic diseases of the bladder attended with more or less retention of urine, the diseased mucus appears to act as a ferment, and to bring on the putrefactive fermentation, accompanied with the production of ammonia. But in this case the urine has an excessively fetid along with the ammoniacal odour; while, in those instances in which the carbonate of ammonia appears to have been secreted by the kidneys, there is no fetor; the smell being merely compounded of that proper to the urine and that of the volatile alkali. The presence of free ammonia in the urine appears sometimes to arise from the decomposition of the ammoniacal salts of that fluid, by the fixed alkali secreted with the mucus in inflammation of the urinary passages. (*G. O. Rees.*) It must not be taken for granted that the urine contains a carbonate whenever it effervesces on the addition of an acid; for strong nitric acid heated with urine invariably produces an effervescence, with the escape of carbonic acid, in consequence of the decomposition of the urea. (Hassall, *Lancet*, June, 1865, p. 648.) The fixed alkalies in the urine may be distinguished by leaving a permanent impression on test-paper, which, when rendered blue by ammoniac urine, is reddened again on drying.

Ferrocyanide of iron has been found in some very rare instances in the urine, giving it a blue colour.

Xanthin (*xanthic, uric,* or *lithic oxide*), of which some very rare urinary calculi are composed, and which is supposed to have the same composition as uric acid, less one equivalent of oxygen, is occasionally deposited by the urine, and is said to be a normal constituent of that fluid, though in very minute proportion. It is a white, waxy, amorphous substance, insoluble in cold but slightly soluble in boiling water, soluble in ammonia and potassa, precipitated from its alkaline solution by acids, becoming yellow when heated with nitric acid, and composed of carbon, hydrogen, nitrogen, and oxygen. It is said to have been found in many of the healthy tissues and in the blood.

Inosite, a principle analogous to sugar, but differing in its chemical relations, as in yielding lactic acid by fermentation, has been found in small proportion in some cases of albuminous and diabetic urine, and in that of syphilitic cachexia, typhus, and phthisis. It is white and crystalline, has the formula $C_{12}H_{12}O_{12}$, and may be known by giving a rose colour with chloride of lime and ammonia, dropped on the residue left on evaporating to dryness the liquid resulting from the addition of a few drops of nitric acid to a solution of the presumed inosite. This principle has been found in the muscles, brain, lungs, &c., and is probably one of the effete results of the change of tissue. It is of little importance, except as probably indicating an abnormal condition of metamorphosis in the system.

Cystin (cystic oxide), long known as an ingredient of urinary calculi, has been observed in certain urinary deposits, and in the urine itself, either dissolved, in suspension, or forming a film on the surface. Its presence may be suspected when the urine has a greenish-yellow colour, a peculiar odour, as of the green brier mixed with that of fetid urine, and an oily, slightly turbid appearance. The chemical characteristics of this substance are insolubility in acetic, citric, and tartaric acids, and solubility in diluted muriatic acid, and in the solutions of potassa and soda, from which it is thrown down by bicarbonate of ammonia. It emits a peculiar odour when heated; and in stale urine gives it the odour of sulphuretted hydrogen. It is remarkable for the very large proportion of sulphur contained in it, which constitutes 27 per cent.; the other constituents being carbon, hydrogen, nitrogen, and oxygen. It is strictly pathological, not being found in the urine in health. It is said to be associated with the scrofulous diathesis and the fatty liver; and there is some ground for suspecting that it may be hereditary.

Leucin and *tyrosin*, which are organic results of the decomposition of the tissues, and have for some time been familiar to chemists as the product of certain chemical actions on organic matter, are interesting here only as having been found in the urine in a very fatal disease known as acute jaundice, or acute atrophy of the liver. Hence, their presence in the urine would, with our present knowledge, be deemed of almost fatal significance. (See *note on Acute Jaundice*, page 574.)

Glycocholic acid, one of the constituents of the bile, supposed to be generated by the liver, has been found in the urine in certain cases of jaundice, and, when found there, may be considered as probable evidence that the jaundice is dependent on obstruction of the biliary passages, and subsequent absorption of the bile; as this acid has never been detected in healthy blood, and could have entered it only through absorption of the retained bile.

Nitric acid appears to exist sometimes in the urine. This acid generates by reaction with uric acid peculiar products, which, by reaction with ammonia, give rise to a red colouring matter, considered by Prout as a combination of a peculiar acid, denominated purpuric, with ammonia. It is the *murexide* of recent chemistry. To this compound Prout ascribed the pink or red colour of certain urinary deposits; but the opinion does not appear to have been confirmed by direct analysis, and has the authority of Berzelius against it.

Phosphorus, in a free state, is asserted to have been observed in urine, rendering it luminous in the dark.

The *colour* of the urine is occasionally changed, assuming, under different circumstances, a *deep-yellow*, *green*, *blue*, *red*, *dark-brown*, and *black* hue. The causes of these changes are not always known; but much of late has been added to our information on the subject. It is supposed that the normal colour of urine is owing to a peculiar principle named by Dr. Harley *urohæmatin*, derived from the blood, and closely analogous to, if not identical with, the hæmatin of the red corpuscles. This may exist largely in even morbidly pale urine, so combined as to destroy its colour; but, under these circumstances, the addition of nitric acid will liberate it, and render the urine deep-red; and this is a method of distinguishing between a normal light-coloured urine, which is of little significance, and another which may be loaded with the results of the decomposition of the blood. The urine is sometimes dark-red or brown from the mere disproportion of the urohæmatin in a free state. A similar discoloration is sometimes produced by blood in the urine, as in hæmaturia. This may be distinguished from the former by means of the microscope, by which the presence of red corpuscles will be revealed; or by the addition of muriatic acid, which diminishes the colour if dependent on the presence of blood, but deepens it if on an excess of urohæmatin. (*Harley.*) The admixture of the colouring matter of bile gives a deep-yellow, brown, and sometimes almost a black hue to the urine. A green colour may arise from the same source. The blue colour has in one or two cases been traced to Prussian blue. But an *indigo* blue colour was observed by Dr. A. H. Hassall, in urine which had been a short time exposed to the air; and the same observation has since been made by others. Dr. Hassall found this discoloration to depend upon an organic principle chemically identical with indigo. This never appears when the urine is first discharged, but only after exposure. In this respect, moreover, it resembles indigo, which is not blue in the plant producing it, but becomes so through oxidation when exposed to the air. The indigo appears only in pathological conditions, but the nature of these conditions has not been satisfactorily ascertained. (*Philosoph. Mag.*, Sept. 1853.) An idea formerly prevailing, that urine owed its ordinary hues to two colouring matters, one yellow and the other red, seems now to be unsupported; and the probability is that there is one distinctive principle, which assumes different hues with different degrees of oxidation, being under certain circumstances yellow, under others red, deep-brown, blackish, or even blue; and that, in a certain degree of oxidation, this principle is represented by the hæmatin of the blood, and the urohæmatin of the urine. This colouring matter has a strong affinity for the urates, and is deposited with them from the urine, giving them the characteristic reddish tints, as seen in urinary sediment, but not belonging to them when pure. By the addition of acids or alkalies, its colour is changed by change in oxidation or combination. Thus, in a case recorded by Munk, in which for two years the patient had complained of lumbar pains and tremors of the lower limbs, and had at last become much weakened, the urine when passed was dark-red, became darker when heated with nitric acid, assumed with sulphuric acid a deep-violet hue, was decolorized by muriatic acid and zinc, but again reddened by nitric acid, and was rendered green by ammonia. The colouring matter, when isolated, was found to correspond with urohæmatin in its solubilities, and in containing iron. (*Med. T. & Gaz.*, Sept. 1864, p. 273.) The brown and blackish urines sometimes owe their colour to blood, probably decomposed in the pelvis of the kidneys or in the bladder. This is dark-coloured and often opaque when passed, but on standing deposits a sediment, which, on examination by the microscope, is found to consist of a dark granular pigment and some blood-corpuscles, with renal casts, uric acid crystals, &c. But there is another kind of dark urine, which is clear when passed, but gradually becomes black on exposure; and the change may be produced immediately by the addition of oxidizing agents, as nitric and chromic acids. This kind of urine was found by Dr. Eiselt, of Prague, to be associated with melanotic cancer, and to owe its colour to *melanin*, which is only a modification of the hæmatin of the blood. This black urine, whether passed as such, or becoming so on exposure, is of serious significance, though not necessarily fatal, as it has been noticed in connection with non-malignant affections.*

The *odour* of the urine is sometimes very much changed. Its occasional ammoniacal smell, and the fetor arising from its putrefaction have been already noticed, as have also the effects produced upon it by certain substances taken into the stomach. Even the odour of ordinary kinds of food may now and then be detected in it, in cases of feeble digestion. But it is sometimes extremely offensive, as secreted, without any obvious source of the fetor. Under such circumstances, it may be inferred that there is some concealed morbid action, probably affecting the constitution of the blood; and a fair indication is offered for the internal use of creasote, the alkaline chlorides, and perhaps of nitromuriatic acid.

To complete this view of the morbid states of the urine, it is proper to refer to the additions derived, not from the renal secretion, but from the mucous coat of the passages, or some other source communicating with them.

* *Urochrome.* The account in the text of the colouring matter of the urine is in accordance with the statements of Dr. Geo. Harley on this subject, published in the *Med. Times and Gaz.* (Aug. 1864, p. 218); but they appear to me hardly reconcilable with the subsequent observations of Dr. Thudichum, the results of which are given in the *Am. Journ. of Med. Sci.* (April, 1865, p. 471), taken from the *British Med. Journ.* for Nov. 1864. Dr. Thudichum claims to have discovered the peculiar colouring matter of the urine, which he calls *urochrome*, and which he supposes to be a derivative from albumen, without any relation to the colouring matter of the blood or of the bile. It is, when pure, yellow, readily soluble in water, less so in ether and alcohol, and imparts its yellow colour to its solutions, which still remain yellow when concentrated. By a simple process, probably of oxidation, it passes into a red substance, *urerythrine*, which sometimes reddens the urine in disease. It may be decomposed, by various processes, into a red resin, consisting of *uropittine*, *omicholic acid*, and *uromelanine* (all nitrogenous bodies). To the two former of these products the fetid odour of decomposing urine is owing; and it is to uropittine and omicholic acid, generated in the blood by the retained urochrome, that most of the phenomena characteristic of what is called uræmia, are ascribable, and among them the smell of the breath and perspiration. These are certainly extraordinary conclusions, and if confirmed, will throw a new light on the pathology of the urine; but, not having seen any detailed account of the experiments which are supposed to justify them, I do not feel authorized to adopt them unreservedly, or to abandon any of the hitherto admitted facts with which they seem incompatible. (*Note to the sixth edition.*)

Mucus exists in small proportion in healthy urine. It is sometimes very much increased in consequence of irritation or inflammation of the membrane lining the bladder, pelvis of the kidney, &c. A slight cloudiness may often be observed, dependent on multitudes of minute scales of the mucous epithelium, which is thrown off and removed like the cuticle in ordinary health. This desquamation, like the secretion of mucus, may be excessive. The mucus appears to be in different states in the urine. Sometimes it is dissolved, giving to the liquid a ropiness, and tendency to froth on slight agitation. In this state it is distinguished from albumen by not coagulating with heat. In other cases it forms a cloudiness, which gradually separates and falls to the bottom as a loose sediment. In another form it is thick and tenacious, so as occasionally to retain its place in the vessel when inverted. In this state, it is sometimes discharged in great quantities in catarrh of the bladder.

Pus is not unfrequent in the urine as a result of mucous inflammation or ulceration of the kidneys or passages, or of abscesses formed in their walls or in adjoining parts, and opening into the passages. According to Mr. John Hamilton, of Dublin, it may be known to be from the latter source, when the urine containing it continues acid after having stood several hours. (*Dub. Quart. Journ of Med. Sci.*, xi. 311.) Sometimes the pus passes out nearly pure with the urine, and sinks to the bottom of the vessel upon standing. In this case it has a yellow colour, is readily miscible with the urine, from which it again soon separates, and, when examined by the microscope, exhibits the pus corpuscle. Very often, however, the discharge is more or less mixed with mucus, and presents the appearance of that transition state from mucus to pus, which marks a certain stage of inflammation of the open passages. When urine contains pus, it is always albuminous. This is an important fact in diagnosis.

The *prostatic* and *seminal* fluids sometimes exist in urine. The presence of the latter is known by the spermatozoa or spermatic animalcules, which may be detected by the microscope.

Of *blood* in the urine, which is not an uncommon impregnation, sufficient is said in a preceding paragraph (*page* 653), and under *hæmaturia*.

Microscopic *fungi*, and *animalcules* belonging to the *infusoria* are not unfrequently observed in urine which has been allowed to stand for some time after evacuation. (See *page* 647.) *Sarcinæ* have been noticed even in urine freshly discharged, and in one case, described by Dr. J. W. Begbie, were persistent for a considerable time. The patient was affected with lumbar pains, frequent micturition, and dyspeptic symptoms. (*Ed. Med. Journ.*, April, 1857, p. 902.)[*]

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[*] It was, until of late, customary, in estimating the quantity of urine, or of its several constituents evacuated daily, to have reference to men individually, without regard to their respective weights. But as the normal disintegration of the tissues is in some degree proportionate to the weight, it follows that the amount of effete matter normally discharged by the kidney must be very different in different individuals; and if we wish to avoid serious mistakes in estimating the health by the proportion of urinary contents, we must have, as a standard of comparison, the quantity eliminated, on an average, for each pound, or some other recognized denomination of bodily weight. Such a table has been prepared by Dr. E. A. Parkes, of London, in his valuable work on "*The Composition of the Urine in Health and Disease,*" &c.

The following is the table of Dr. Parkes, giving the average quantity of the more important urinary constituents passed in 24 hours for each avoirdupois pound of the bodily weight.

Water	2·9 f℥.	Creatinin	0·048 grains.
Urea	8·58 grains.	Pigments and extractives	1·062 "
Uric acid	0·059 "	Sulphuric acid	0·214 "
Hippuric acid	0·237 "	Phosphoric acid	0·336 "
Creatin	0·032 "	Chlorine	0·875 "

Of course, to obtain the normal amount for each individual, the number in the table is to be multiplied by his weight in pounds.

Volumetric analysis. This method has been to a considerable extent adopted in Europe

Article VII.

DIURESIS.

UNDER this term are included all the complaints consisting in an excessive inary secretion, with the exception of the one characterized by the presence ' sugar, to which, following the example of Dr. Prout, I propose confining e term diabetes. These complaints have been commonly designated by au- ors as *Diabetes insipidus;* but this name does not express the fact, as the ine is not always tasteless. Diuresis may be simply a morbidly increased dis- iarge of urine, differing from that of health only in being more dilute; or may be attended with a material and permanent alteration in the character the secretion.

SIMPLE DIURESIS.—*Hydruria* (Willis).—A temporary increase in the se- ction of urine, depending on an excess of liquid swallowed, exposure to cold, ental anxiety, the use of diuretic articles of food or drink, &c., without any sturbance of health, or considerable inconvenience, can scarcely be looked on as morbid. Perhaps we may consider in the same light the copious dis- iarges of pale, watery urine, which frequently attend the hysterical paroxysm, id to which persons of an irritable, nervous constitution, are occasionally lia- a. Dr. Willis found, upon examination, that, though the specific gravity of e urine was very low, sometimes even as low as 1·002, and consequently the lid constituents small in proportion, yet these several constituents bore to ch other about the usual relation.

But instances of diuresis are not unfrequently met with of a more perma- nt character, affecting the comfort of the individual by the frequent and ha- ssing calls to evacuate his bladder, often at the most unseasonable times, in- rrupting his rest at night, occasioning troublesome thirst, and, if not arrested, oducing at length a greater or less degree of debility, and loss of flesh. Such ses are apt to occur in individuals of excitable or nervous temperament, and pecially in dyspeptics, who are sometimes greatly alarmed lest an attack of real abetes may have set in. They are, moreover, not uncommon in people who ve passed the middle life, and whose bodily powers have begun somewhat to il. The affection, in such instances, is apt to be considered as mere irritation the bladder; but, upon examination, it will be found that the amount of

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the means of estimating the constituents of the urine, whether in its normal or patho- gical condition. The method is supposed to enable persons of very moderate chemical owledge to ascertain, according to certain given formulas, the relative proportion of y one of the ingredients of the urine. But, having closely considered the subject, I s convinced that a want of exercised skill would lead to great errors; and the proba- lities are that the errors made in the estimate by such individuals would often be so eat as altogether to vitiate the result, and thus to cause more harm than any possible od would compensate. It is essential that certain test-liquids should be prepared, which, not exactly such as intended, would necessarily lead to great mistakes; and, for a re- ible practice of the method, it would be indispensable that the operator should be able ther to prepare these liquids himself, often requiring much care and skill, or to estimate ir purity and fitness if obtained from others. My views on this point have been fully firmed by Dr. Hassall, who, after a careful experimental examination of the subject, clared that the heretofore published results, based on this method, could not be relied i. (*Lancet*, June, 1865, p. 649.) With these convictions on the subject, I have contented yself with indicating, when the case seemed to require it, the ordinary method of esti- ating the quantity of any urinary ingredient, and have omitted the introduction of the veral volumetric processes, which might be worse than useless. Any ordinarily in- ructed physician will be able, by the methods mentioned, to determine the urinary ingre- ents with sufficient accuracy for general practical purposes. Where more skill and curacy are needful, he should have recourse to the aid of professional chemists. (*Note the sixth edition.*)

urine daily evacuated is much above the healthy average. Now and then cases occur of profuse diuresis of a very permanent character, without any known cause; and the statements on record of the amount of urine passed, and water drank daily, in some of these instances, during a long succession of years, are almost incredible. Thus, a man aged fifty-five was admitted for an accident into the Hôtel-Dieu, at Paris, who, during his stay, passed daily, on an average, thirty-four pounds of urine, and drank thirty-three pounds of water. The account states that this individual had been affected in a similar manner ever since his fifth year, and that, from the age of sixteen upwards, he had daily consumed not less than two bucketfuls of water, and discharged a commensurate quantity of urine. (*Willis on Urinary Diseases.*) It is sometimes difficult to determine, in these cases of excessive thirst (*polydipsia*) with profuse diuresis, which of the two affections is primary. The singularity is, that the system should support so long such an enormous excess of one of its functions, without greater evidence of suffering. Nevertheless, though in some instances the affection may be borne with impunity, and the vital actions accommodate themselves to the great strain upon them, yet there must be considerable danger in the process; and the kidneys at least must be liable to serious organic disease from the continued functional disturbance. They may, therefore, be considered as proper cases for medical interference.

The urine in profuse diuresis is usually pale or colourless, quite transparent, and of very low density, sometimes scarcely exceeding that of water. Its low sp. gr., the absence of a sweet taste, and the fact that it will not ferment with yeast, are sufficient evidences that it is not of the true diabetic character.

The treatment of simple diuresis must be directed chiefly to the regulation of the habits of the patient, and the improvement of his general health. In the first place, his own will should be brought to the aid of the physician. It is probable that occasionally the affection may have originated in, or at least may be sustained by a habit of excessive drinking. The patient should, therefore, be induced to take as little drink as may be at all consistent with his comfort, and should avoid altogether liquids calculated especially to excite the kidneys. The diet, too, should be of a kind least likely to provoke thirst; and salt food, and the use of much salt as a condiment, should be avoided. In order to divert action from the kidneys, all the other emunctories should be sustained in full operation. The liver, if torpid, should be stimulated by nitromuriatic acid; the bowels should be kept regular by rhubarb and aloes, compound extract of colocynth, sulphur, &c., the saline cathartics being prohibited; and efforts should be especially made to promote the functions of the skin by the frequent use of the flesh-brush, by the warm or vapour bath every day or every other day, by woollens next the skin, and by moderate exercise. Nervous irritability should be controlled by narcotics and tonics. Opium often has a very happy effect, and is preferable to the salts of morphia, which I have sometimes known to stimulate the kidneys actively. It may be advantageously given combined with an equal proportion of ipecacuanha at bedtime, so as to obtain at once its diaphoretic and narcotic effects. Of the tonics, the mineral acids, chalybeates, and simple bitters, including the preparations of Peruvian bark, may be employed. In some instances, the disease appears to be connected with laxity of the kidneys, and may be treated with astringents. In such cases, I have seen the oil of turpentine apparently very efficient.

As dyspepsia is not unfrequently the basis of the disease, the whole regimen and course of treatment adapted to that affection should be employed.

COMPLICATED DIURESIS.—Several varieties of diuresis have been described, in which, along with the excess in the quantity of urine, there is superabundance or deficiency of one of its solid constituents, or the addition of some new principle not usually contained in it. Mere occasional derangements,

ever, of this kind, can scarcely be considered as morbid. It is by a cer-
degree of persistency that they acquire a claim to be thus regarded. The
ties hitherto noticed are those connected with an excess or deficiency
rea, the presence of albumen, or that peculiar derangement known as the
ous or chylo-serous urine.

reous *diuresis*, the *azoturia* of Willis, is characterized by an excess of
. The attention of the profession was first called to it by Drs. Bostock
Prout. The urine is generally pale and transparent, but sometimes brown-
has an acid reaction when first discharged, and is, perhaps, somewhat
rier than in health, having a specific gravity varying from 1·015 to 1·085,
averaging generally about 1·020. It soon undergoes decomposition, and
mes alkaline. Nitric acid added to it usually occasions, after a short time,
tallization with the urea, either without a previous concentration of the
e, or with a degree of concentration too slight to afford the same result in
healthy state of the secretion. An excess of urea is thus indicated. But
ay also be in excess even should the test fail; for the quantity of urine is
uch increased, that more than the daily average of urea may be discharged,
gh the degree of impregnation should even be less than in health. From
a gallon to a gallon or more of urine is passed daily; and, even where
amount is not greatly increased, it is liable to be so by slight causes which
ld scarcely be felt in health. It is said that the daily discharge of urea has
alled nine and a half ounces, while, in the healthy state, it is only, on the
age, a little more than an ounce. With this character of the urine, there
ten much thirst, sometimes an increased appetite, a sense of weight or dull
in the back, a sinking, gnawing, or other uneasiness at the pit of the sto-
h, and more or less debility and emaciation, with an anxious expression of
ntenance. But the skin is not dry and parched, nor is the thirst so insatia-
as in the saccharine diabetes.

he causes of this complaint are unknown. Dr. Prout mentions, as pro-
le predisposing causes, hereditary influence, intemperance and the abuse
he sexual propensity in early life, mental anxiety, and mercurial action.
s apt to attack persons of spare habit and nervous temperament, and gene-
y occurs in those of middle age, and in men more frequently than women.
ldren are not exempt from it, and, there is reason to think, occasionally
ish under it without the cause being known. In the case of a young man,
er my care in the Pennsylvania Hospital, in whose urine, which was about
mal in quantity, nitric acid produced a copious crystallization of nitrate
rea, the patient was dyspeptic, anemic, and considerably emaciated. No
er disease could be detected. The affection seemed to be either a too rapid
ntegration of the tissues, or a defective assimilation of the food. He im-
ved under the use of nitromuriatic acid and cod-liver oil.

he disease is said to be an occasional precursor of diabetes, with which,
ever, it sometimes alternates or coexists. If taken early, it is thought to
enerally curable.

he treatment must be regulated upon general principles. If there is pain
he back, cups may be applied; but depletion is not usually required. To
port the digestive process and the general strength by tonics, to keep the
els regular by means of laxatives, to divert to the skin by the warm bath,
er's powder and warm clothing, and to control the general irritability and
ssive renal action by opiates, are the chief indications. Dr. Harley recom-
ds citrate of iron and quinia as having extraordinary efficacy in restrain-
the waste of the tissues; and, with this view, it might be specially useful in
present affection. Saline cathartics, and all other substances calculated to
tate the kidneys are objectionable. The patient should take moderate exer-
, and follow the same regimen generally as in dyspepsia. There would

seem, however, to be an indication for coffee and tea, if it be true, as supposed, that they lessen the excretion of urea; and, as a non-nitrogenous diet, consisting of saccharine, amylaceous, and oleaginous substances, acts powerfully in diminishing the excretion of urea, it might be a question whether this effect might not justify their trial, even though a more supporting treatment seems to be indicated. At all events, it would be perfectly justifiable to use cod-liver oil, which is said to have a similar influence on the excretion of urea.

Anureous diuresis, the *anazoturia* of Willis, is marked by the very copious secretion of a colourless or straw-coloured urine, of a density scarcely exceeding that of water, of a faint odour, a weak acid reaction when first discharged, but becoming slightly ammoniacal upon standing, and containing very little urea. The attendant symptoms are thirst, a parched mouth, a craving appetite, gnawing in the epigastrium, constipation, dryness of skin, depression of spirits, debility, and emaciation. Such is the description given of this affection; but it does not appear to me to be sufficiently distinguished from simple diuresis. If the daily amount of urea is greatly deficient in some cases, it is not very strikingly so in relation to the other solid constituents. Dr. Willis believes the disease to be not unfrequent among the children of the poor. Dr. Christison considers it as the form of diuresis which is sometimes met with in the advanced stage of Bright's disease. The treatment recommended does not differ materially from that considered applicable to the simple variety. But there would here be an obvious propriety in using an animal diet, and excluding the non-nitrogenous vegetable substances.

Albuminous diuresis sometimes occurs in the advanced stage of Bright's disease. The presence of albumen has probably nothing to do with the increased secretion of urine; but it serves, in connection with the low specific gravity, to indicate the origin of the complaint in organic disease of the kidneys. It is alluded to here merely as one of the varieties of the so-called tasteless diabetes. (See *Bright's Disease.*)

According to Dr. G. Owen Rees, large quantities of the *extractive matter* of the blood pass with the urine in certain cases of diuresis. It may be detected by means of the tincture of galls, in the manner indicated in *page* 649. The affection serves as a great drain upon the system, and is the occasional source of anæmia and general debility. (*London Med. Gaz.*, July, 1851, p. 137.)

The term *chylous diuresis* may be used to designate the increased secretion which sometimes attends the *chylo-serous urine*. This has been already sufficiently described. (See *page* 647.)

Article VIII.

DIABETES.

Syn.—*Diabetes Mellitus.*—*Honey Diabetes.*—*Saccharine Diabetes.*—*Glucosuria.*—
Melituria (Willis).

THIS disease is characterized by an excessive discharge of saccharine urine. It consists essentially in the production and elimination of glucose or grape sugar, the diuresis being merely incidental, and dependent on the existence of that principle in the blood. Indeed, there is reason to suppose that the saccharine state of the urine may at least sometimes precede the excessive secretion; and it is known often to remain after the diuresis has for a time disappeared. A disease so distinct merits a distinct designation; and hence it is proposed in this work, in imitation of Dr. Prout, to appropriate to it exclusively the name of Diabetes, before applied to all diseases indiscriminately in which a great excess of urine is a prominent symptom. Dr. Thos. Willis, who ived in the time of Charles II. of England, is believed to have been the first who noticed the sweetness of diabetic urine. The complaint is not very frequent n this country. It is probably more so in Great Britain; as Dr. Prout states that in twenty-five years he saw more than five hundred cases.

Symptoms, Course, &c.—Diabetes is almost never recognized at its very commencement; and it is not usually until after the lapse of a considerable time that the attention of the physician is called to it. The symptom which, in general, first attracts the notice of the patient is the frequency of his calls to evacuate the bladder, by which he is often disturbed several times in the night. He soon also observes that the quantity of the urine is much increased, and accident sometimes leads him to the discovery of its sweet taste. The physician is now consulted, and finds, in addition to the symptoms mentioned, thirst, a clammy state of the mouth and fauces, a coating of frothy mucus or white fur upon the tongue, constipated bowels, a dry, harsh skin, a sense of weariness or dull pain in the back, loins, and lower extremities, frequent, and in some cases almost constant chilliness, a general feeling of lassitude, weakness and indisposition to bodily or mental exertion, and a daily increasing emaciation. Dyspeptic symptoms are also frequently exhibited; such as sour eructations, oppression or weight in the epigastrium, burning sensations about the præcordia, &c. The appetite, however, is seldom impaired, but on the contrary often increased. Thus affected, the patient may be considered as in the first stage of the disease. If this continue to advance, the symptoms assume a more violent character. The discharge of urine is increased, and the craving for drink, and often for food, becomes inordinate and insatiable. From twenty to thirty, or even forty pints of water are sometimes drank daily, and enormous quantities of food consumed; and yet the patient is never satisfied, nay, sometimes feels the craving increase with the means used to gratify it. Along with this excessive thirst and hunger, and probably contributing to them, are a parched state of the mouth and fauces, and a sensation of hollowness or sinking, with faintness, at the pit of the stomach. The food, notwithstanding the quantity consumed, produces no increase of flesh. On the contrary, a steadily progressive emaciation is almost always noticed, with increasing debility both of body and mind. The general temperature is somewhat lowered, the sexual propensity lost, the spirits depressed, the temper soured or peevish and fretful, and the memory and intelligence impaired. The lungs and surface of the body exhale a disagreeable sweetish odour. The feces are said to be destitute of their characteristic offensiveness, and to be scanty and very dry. The tongue is now either red at the edges and furred in the middle, or uniformly red and smooth. The gums assume a dark-red or purplish hue, are soft and spongy, bleed easily, and often separate from the teeth, which are thus loosened. With this scorbutic state of the mouth, the breath, instead of retaining the sweetish odour before mentioned, becomes offensive. Occasionally a redness like that of the mouth is observed at the orifice of the urethra, and a sensation of heat is experienced along the urinary passages. Serious organic disease is now apt to set in. Cataract has been repeatedly noticed in connection with the disease, and is supposed to be one of its occasional effects.* Tubercles are often developed in the lungs, with the usual attendant symptoms. Sometimes Bright's disease of the kidneys occurs, indicated by an albuminous impregnation of the urine. At this stage, the patient sinks rapidly, the emaciation and debility become extreme, the fauces assume a dark-red or aphthous appearance, the extremities swell, the urine diminishes, loses its saccharine character, and at last is almost wholly suppressed, and the patient dies exhausted and comatose.

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* In relation to the occasional existence of cataract in diabetic patients, it might be supposed that the association is merely accidental; but some experiments of Dr. S. Weir Mitchell, of Philadelphia, in which cataract in frogs was developed when sugar was in various ways introduced in excess into their system, seem to show that glucose in the circulation may possibly contribute directly to the production of opacity in the crystalline lens. (*Am. J. of Med. Sci.*, Jan. 1860, p. 106.)—*Note to the sixth edition.*

The urine in diabetes is of a pale-yellow or greenish-yellow colour, a faint sweetish odour, which has been compared to that of fresh hay or milk, and a sweet taste, which, however, is not always very distinct.* The quantity discharged varies much, but almost always greatly exceeds that of health, and is sometimes enormous. From ten to twenty pints are usually passed daily, often thirty pints, and occasionally forty or fifty pints or even more; and this average is maintained for weeks and months together. Contrary to what might have been anticipated from the quantity of the urine, its density is undiminished, and often much increased. The sp. gr. is seldom below 1·020, and is sometimes as high as 1·055, or even higher. The average is probably about 1·040. The ordinary solid ingredients of urine, as the urea and salts, though smaller in proportion to the liquid part than in health, are yet undiminished if reference be had to the whole daily discharge. The urea is sometimes increased beyond the healthy standard.† The uric acid is said to be almost invariably deficient. The increased density, therefore, must be ascribed to a new ingredient. This is sugar, of the variety known to chemists by the name of *glucose* or *grape sugar*. It may be obtained separate in the crystalline state without difficulty. A portion of the saccharine matter, however, appears to be uncrystallizable.

As the saccharine taste is not always very obvious, and the application of this test at best not very agreeable, it is important to possess some other means of detecting the presence of sugar. This may be done by a very simple process. Like other liquids containing sugar, diabetic urine is capable of undergoing the vinous fermentation, upon the addition of yeast, at a suitable temperature. No such change takes place in healthy urine under the same circumstances. To test the urine, therefore, nothing more is necessary than to add yeast, and expose the mixture to a temperature of 70° or 80°. If it be diabetic, an effervescence will speedily commence, gas will escape, and the liquor will acquire a vinous odour. Dr. Christison says that he has thus detected one part of diabetic sugar in 1000 parts of urine. By collecting the carbonic acid over mercury, and measuring it, we can ascertain also with tolerable accuracy the proportion of sugar present, allowing for every cubic inch of the gas about one grain of sugar. Another test, proposed by Runge, is to dry a drop or two of urine upon a surface of porcelain, and to let fall upon the spot a drop of sulphuric acid, diluted in the proportion of one of acid to six or eight of water. If sugar be present, a blackish colour will be developed. (*Willis on Urinary Diseases.*) The reaction of grape sugar with the salts of copper at an elevated temperature, and the effect of the alkalies upon it, offer the methods of testing it at present most relied on.‡ If diabetic urine be allowed to stand, without addition, in a moderate temperature, it will undergo spontaneous decomposition, ultimately becoming acid, and having the smell of sour milk. (*Ibid.*)

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* Diabetic urine is said sometimes to contain a tasteless kind of sugar, which, according to Bouchardat, corresponds in all its chemical properties with ordinary diabetic sugar having the property of fermenting, and being converted into sweet sugar by the acids. (*Simon's Chem.*, ii. 293.)

† Simon states that the ratio of urea to the other solid ingredients is always less than in health, and that it is diminished in proportion to the increase of sugar; but this is probably a mistake; as the urea is generally said to be augmented; and Dr. Harley once found 1085 grains of it to be passed with the urine in a single day. (*Med. T. & Gaz.*, April, 1864, p. 446.)

‡ *Trommer's test*, which is based on the reaction of the salts of copper, is applied in the following manner.—Add enough solution of sulphate of copper to the urine to give it a faint blue tint. A little phosphate of copper generally falls. Then add solution of potassa in great excess. The oxide of copper precipitated at first is redissolved in the excess of the alkali, producing the peculiar blue of ammoniated copper. If the liquid be now gently heated, a red suboxide of copper falls when diabetic sugar is present. As albumen interferes with the satisfactory working of the copper test, any urine contain-

ing it should be heated and filtered so as to separate this principle, before the application of the test. Horsley gives the following precise directions for the preparation of the copper-test, which he considers important. Take of sulphate of copper ʒss; distilled water f℥iij. Dissolve with heat; then add of tartaric acid ʒss; and, after cooling, of caustic potassa ʒiss. One fluidounce of the test-liquid, thus prepared, boiled with half a grain of grape-sugar dissolved in a little water, gives a scarlet precipitate of one and a half grains, of which one-third is glucose. (*Am. Journ. of Pharm.*, xxxiv. 248)

Moore's test depends upon the property of sugar of being converted into a brown substance (melassic or sacchulmic acid) under the action of an alkali. To two fluidrachms of the urine in a test tube, nearly a drachm of liquor potassæ is to be added, and the mixture boiled for a minute or two over a spirit-lamp. If sugar be present, the urine will assume an orange-brown or bistre tint according to the quantity. In applying this test, it is necessary to bear in mind a fact ascertained by Dr. G. O. Rees, that solution of potassa, kept in white glass bottles, sometimes contains so much lead as to produce a brown colour in albuminous urine, which might be mistaken for the effects of sugar To guard against this fallacy, the solution of potassa should be tested for lead by hydrosulphate of ammonia, before being used. (*Ranking's Abstract*, v. 286.)

In very high-coloured urine, the indications of the tests for glucose, when only in small proportion, are so obscured as to render them unreliable. In such cases, the urine should be shaken with animal charcoal and a very little carbonate of soda, so as sufficiently to decolorize it, before the test, whether of copper or potassa, is applied.

According to Dr. A. Becquerel, these tests are liable to fallacies, from the presence in the urine of substances which modify their results, and which may be separated by acetate of lead. He, therefore, proposes, when either of the above tests is to be applied, first to treat a certain quantity of the urine with two parts of the solid acetate with the aid of heat, to separate the precipitate which forms by filtering, to heat the clear liquid with four parts of sulphate of soda, and to separate the sulphate of lead by another filtration. The liquid thus treated contains the sugar, and is prepared for the application of the test.

M. Maumene, of Rheims, proposes the following test, which he finds extremely delicate. A strip of white merino, or other tissue not affected by chloride of tin, is dipped in a strong solution of that salt, and dried. A few drops of the suspected urine, placed upon the strip thus prepared, and exposed to a heat from 260° to 300° F. immediately produce a black or dark-brown stain. (*Med. Gaz.*, April, 1850, p. 604.)

M. Cailliau proposes *chlorine* as a test. If urine containing diabetic sugar be strongly shaken with half its volume of chloroform, the mixture will become milky, and, on standing, will separate into two layers, the upper clear and nearly colourless, the lower white, thick, and gelatinous. The upper layer, separated and allowed to evaporate, becomes syrupy; and, after some days, the sides of the vessel containing it will be covered with the wart-like concretions of the sugar. (*Chem. News*, Aug. 13, 1864, p. 74.)

Böttger's test of *subnitrate of bismuth* is recommended as preferable even to that of copper. This salt is reduced by alkaline liquids containing glucose, but not by those with cane sugar. If a solution of carbonate of soda be added to urine, and then a portion of the subnitrate, and the mixture be boiled, the salt of bismuth will be immediately blackened if a trace only of glucose be present, but will remain white if there be none. (*Journ. de Pharm. et Chim.*, 3e sér., xxxii. 371.)

Still another is the *caramel test*. Evaporate a few drops of the urine, on the end of a slip of tinned iron, by means of a spirit-lamp. By regulating the heat, the liquid may be driven off, leaving scarcely a visible trace. If the heat be now increased so as to decompose the organic matter left, should diabetic sugar be present, the surface will assume a rich, reddish-brown colour, of a beautiful lustre, owing to the formation of caramel. (*Pharm. Journ. and Trans.*, Aug. 1861.)

Sometimes urine containing cystine undergoes a species of viscous fermentation, ending in the appearance of much ropy mucus, which might be mistaken for the saccharine. The odour, however, is different, being disagreeable and sulphurous, instead of vinous. (*Bird on Urin. Dis.*, Am. ed., p. 198.)

The quantity of sugar in the urine may be approximately estimated by the fermenting process, in the following method, proposed by Dr Wm Roberts. Into a 12 oz. bottle introduce 4 fluidounces of urine and a little yeast, cork it loosely, and put it in a warm place to ferment. Put the same quantity of the same urine into a 4 oz. bottle, which is to be tightly corked and placed beside the other. At the end of 22 hours, when the fermentation will have been completed, transfer the bottles to a cool place, and allow them to stand two hours. Then pour their contents severally into two sp. gr. bottles, and ascertain the density of the fermented and unfermented urine. Every degree of the sp. gr. of

Dr. Arthur Hassall has ascertained that the yeast fungus is developed in diabetic urine freely exposed to the air, if an acid be present; and that in this way a quantity of sugar may be detected, with the aid of the microscope, too small to give any evidence of its presence by the ordinary chemical tests. (*Medico-chirurg. Trans.*, xxxvi. 75.)*

From tables prepared by Dr. Henry, of the amount of solid matters contained in urine of different densities, it appears that, in a case in which only one gallon is discharged daily of the average sp gr. of 1·040, the amount of solid matters discharged at the same time would somewhat exceed a pound troy; and this is sometimes doubled, tripled, or even quadrupled for many successive days or even weeks. The whole quantity of solids thus eliminated often considerably surpasses that of the dry food taken into the system.†

The urine in diabetes is sometimes albuminous, as shown by the tests of heat and nitric acid. It has been ascertained also, in some instances, to contain inosite, which, according to M. Gallois, is, along with glucose and dextrin, a result of the transformation of the amyloid or glycogenic matter of the liver. Like glucose, it is increased in the urine by pricking the floor of the fourth ventricle of the brain. (*Journ. de Pharm.*, Avril, 1863, p 272.)

Sometimes the urine is tinged with blood; and Dr Prout states that he has seen it mixed with a whitish fluid like chyle, which sank to the bottom of the vessel, and seemed to act the part of yeast; as the urine underwent the vinous fermentation. Occasionally, in consequence probably of an excess of urea, diabetic urine putrefies and exhales ammonia; but this result is not common.

The quantity of urine discharged in a given time is asserted to be sometimes much greater than that of all the ingesta, including food and drink, even though

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the former less than that of the latter, represents one grain of glucose for each fluidounce. (*Med. T. & Gaz.*, June, 1865, p 30.) In judging of the increase or diminution of the sugar under treatment, it is necessary to remember that the quantity is liable to diurnal changes, with the meals.

* It is asserted that sugar occasionally appears in the urine, when there is no reason to suspect the existence of diabetes. M. Reynoso, in a report made to the French Academy, states that he has found the urine saccharine in persons who have been under the influence of chloroform and ether, also in cases of tuberculosis, pneumonia, chronic bronchitis, asthma, asphyxia, hysteria, and epilepsy, and after the use of various medicines, as opium and other narcotics, quinia, mercury, &c. He is disposed to think that whatever interferes with the respiratory process, whether directly, as diseases of the chest, or indirectly through the nervous centres, as nervous affections and narcotics, may produce this effect. M. Dechambre, in a report made to the Academy of Medicine of Belgium, announces that he has detected sugar in the urine of a large number of old persons whom he has examined, and considers it as a normal result of old age. Dr. A. Becquerel has noticed sugar in the urine in cerebral, spinal, and hepatic diseases, in those of the digestive apparatus, and in the morbid states of gestation and lactation He considers, however, that the diabetic affection thus produced is quite different from the genuine disease, and distinguishes it by the name of *symptomatic diabetes*. He gives as its distinctive characters, that the quantity of sugar in the urine is less, that the urine itself is little if at all increased in quantity, that its density is but slightly affected, and that the ordinary symptoms of the genuine disease are wanting, such as thirst and increased appetite. (*B. & F. Med.-chir. Rev.*, Jan. 1858, p. 199.) Sugar in small quantities has been found in the urine of healthy individuals, and is not uncommon in that of pregnant women. Indeed, it appears from Brücke's analysis, to be, in minute proportion, a normal ingredient of that fluid; and his statements have been confirmed by Dr. Bence Jones and others. (*Med. T. & Gaz.*, June, 1865, p. 565.) These facts would seem to show that, in genuine diabetes, the real diseased condition lies in some special morbid affection, antecedent to the existence of excess of sugar in the blood, which, though one of its effects, may proceed also from other causes; in other words, a saccharine state of the blood is not essentially the disease. (*Note to the fourth, fifth, and sixth editions.*)

† Dr. Christison gives the following formula for ascertaining the amount of solid matter in urine, which Mr. Day, editor of the Sydenham edition of Simon's Chemistry, has found in numerous observations to be the most correct. Multiply the excess of the specific gravity over 1000, by 2·33, and the result is the number of parts of solid matter in 1000 of urine. (*Simon's Chem.*, ii. 290.)

to the weight of the latter, the loss of weight by the body be added. This statement has been denied; and, though the experiments of Bardsley, McGregor, and others, would seem scarcely to leave room for doubt upon the subject, yet such experiments are exposed to so many sources of fallacy, that the apparent result must be received with hesitation; especially as other observations, in which the greatest care was taken to avoid error, have determined, in relation to the cases examined, that the whole amount of liquid discharged from the body in diabetes was exactly equal to that taken into the stomach.* In the supposition that the occasional excess referred to really exists, it has been explained upon one or two hypotheses, either that water is absorbed through the skin or lungs, or that it is produced by the combination of hydrogen and oxygen within the body.†

The symptoms of diabetes above given are by no means uniform in all cases. The supervention of an acute disease, especially of a febrile character, is said to diminish or suspend the secretion of sugar by the kidneys; but, upon the disappearance of the supervening disease, the sugar returns. The complaint presents a very great diversity in its secondary phenomena. Dr. Prout states that, in relation to the minor and concomitant symptoms, he has seen no two cases alike. The thirst, however, is almost never absent during the course of the complaint, and usually increases with indulgence. Hunger is a more variable symptom, and, in some instances, the appetite is rather deficient. Both thirst and hunger are sufficiently explained by the enormous drain of liquids and solids. Constipation of the bowels, and dryness of the skin, though very frequent, are not constant symptoms. Bouchardat has occasionally noticed copious diarrhœa, with a large quantity of oil, which floats on the surface of the stools, and solidifies as they cool. He ascribes this to the use of amylaceous and fatty matters as food, and has found it to cease where this kind of food was forbidden. (*Am. J. of Med. Sci.*, April, 1862, p. 533.) Instead of the chilliness which characterizes most cases, there is sometimes febrile heat. The debility and emaciation are probably invariable when the complaint is of very long duration; but they differ greatly in degree in different cases; and corpulent persons sometimes retain their obesity with little apparent diminution for a considerable time, and either recover, or perish from other diseases without becoming emaciated.

The disease is generally very slow in its progress, lasting sometimes for years, nay for many years, before a fatal termination. Occasionally it appears to cease entirely, either spontaneously or under the influence of remedies, and again returns with equal or increased violence. Not unfrequently it assumes a remittent form. In the great majority of instances, the patient dies of phthisis. Sometimes he is carried off by organic disease of the kidneys, assuming the characters of Bright's disease. Organic affections of other structures, as of the brain, liver, and stomach, may also be the immediate cause of death. He is, indeed, constantly exposed to fatal effects from causes which but slightly disturb the system in health. Dropsical effusion or colliquative diarrhœa, in some instances, precedes the fatal issue. In other cases, death appears to be the direct result of exhaustion and debility, produced by the excessive discharges. The sudden withdrawal of food or drink has sometimes occasioned fatal prostration. Perhaps the overloading of the stomach, under the influence of a ravenous appetite, has led more frequently to the same fatal result

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* See, for the result of experiments by Th. von Dusch, of Manheim, *Archives Générales*, February, 1864, page 222.

† Experiments by Dr. Louis Mandl seem to show that the presence of glucose in the blood has a tendency to impede the exosmose of liquids from the circulation, and to favour their endosmose into it. Thus may be explained the excess of loss by urine over all the ingesta, if admitted to occur; as the atmospheric moisture may be induced to enter the blood through the lungs and skin by the endosmotic quantity imparted to it by the glucose. (*Arch. Gén.*, Août, 1860, p. 161.)—*Note to the sixth edition.*

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Anatomical Characters.—When any organic disease has supervened upon diabetes, the marks of it are of course found in the body after death; but dissection has revealed nothing calculated to throw light upon the nature of the complaint, except that it is not necessarily connected with any organic lesion, and is, therefore, in all probability, purely functional. It is true that the kidneys are often found enlarged and flabby, and sometimes congested, with the tubuli unusually permeable, and the blood-vessels dilated; but these are results which might be anticipated from the excessive work which is thrown upon these organs; and, in some instances, their structure has been observed to be quite healthy. Occasionally the same morbid appearances are found in their cortical portion as those which characterize Bright's disease; but this is a mere supervention of organic affection in the kidneys, like that of tubercles in the lungs, and is much rarer than the latter form of morbid deposition. As might be conjectured, the mucous membrane of the stomach and upper bowels is sometimes congested or inflamed; but in other cases it is quite sound. The stomach is often much enlarged. A congested state of the veins which contribute to the portal circle is very frequent; and the nervous centres sometimes exhibit marks of disease.

Nature.—The discharge of saccharine urine in diabetes is not the disease itself, but only a result of that pathological condition in which the disease consists. The excessive production of sugar, which, in the healthy state, exists but in very small proportion in the blood of the general circulation, or in the urine, and which is found even when not the least particle of saccharine matter is swallowed, is obviously the main character of the affection. The first point, then, in the course of a pathological investigation, is to ascertain where the sugar is generated. Is it in the kidneys? This is not probable. These organs have been ascertained to be much more efficient as mere separatories than producers of the matters they discharge. Thus it is with the urea, and in great measure with the saline matters, which are the healthy ingredients of urine; and thus also it has been shown to be with the albumen and oil occasionally existing in it in disease. The same is the case with the sugar. This principle is merely separated from the blood by the action of the kidneys. But has it been shown to exist in the blood? For a long time it escaped the researches of the most skilful chemists; and for an obvious reason, viz., that beyond a very minute proportion in the circulation it proves offensive to the constitution, and is, therefore, consumed or thrown off almost as fast as it enters. It is not by the kidneys only that it escapes. It was detected in the saliva by McGregor, in expectorated matter by Dr. Francis, and in the sweat and stools by Dr. Charles Frick, of Baltimore, who states that all the secretions which can be examined afford evidence of its presence. (*Am. Journ. of Med. Sci.*, N. S., xxiv. 66.) Patients are said often to have a sweet taste in the mouth; and the odou of their breath, and that exhaled from the surface of the body, are other evidences of the same kind.* But we have positive proof. Sugar was found i the serum of diabetic blood by Ambrosioni, Maitland, and McGregor, and ha subsequently been detected by many other chemists. Dr. McGregor evaporated diabetic serum to dryness, boiled the residue in water, and added yeas to the decoction after filtration and concentration. Vinous fermentation resulted, proving the presence of sugar. It may also be detected in the seru by the tests for sugar already mentioned. (See *note* at page 660.) But what is the origin of the sugar? So far as experiment has determined, only two sources are known. It is now universally admitted that in the normal state of digestion, amylaceous substances taken as food are converted into glucose or grape sugar, through the agency of the saliva and the pancreatic juice. The glucose thus originating, as well as ordinary sugar contained in the food, undergoes other changes in the alimentary canal to fit it for the purposes of nutrition; but there is little doubt that a portion, escaping the assimilating powers exercised in the small intestines, may pass with the current of the chyle, or through the portal system, into the circulation, and thus mix with the blood. But, in diabetic patients, Dr. McGregor ascertained that sugar is formed in the stomach, during chymification, even when no saccharine matter has been swallowed. This happens to a certain extent, though the patient may have been confined to animal food exclusively. Two individuals, one in health and the other diabetic, were vomited and purged, then fed on beef and water exclusively for three days, and at the end of that time were again vomited with sulphate of zinc, administered about three hours after a meal. The contents of the stomach, properly prepared and concentrated, were submitted to the tests for sugar. The matter thrown up by the healthy person showed no signs of fermentation, that of the diabetic patient fermented briskly, though less so than in another case, in which the diet was of the ordinary character. Sugar, then, is produced in the stomach of diabetic individuals, during the process of digestion. We thus discover two modes in which, through the digestive organs, glucose may become excessive in the circulation. Either by some morbid state of the digestive function the glucose is insufficiently changed in the alimentary canal, and thus an abnormally large amount may find its way into the blood; or, even without this cause, and supposing the patient to use animal food exclusively, the diabetic stomach seems to have the power of generating glucose in excess, and thus of sending it unduly into the circulation.

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M. Bernard, in his beautiful experiments upon the functions of the liver, has led to the probable discovery of another source of the diabetic sugar. By these experiments it was ascertained that, when the food is exclusively animal, no sugar exists, in the state of health, in the portal vessels proceeding towards the liver; and it was supposed also to have been determined that, under the same circumstances, it is contained largely in the venous blood proceeding from the liver to the heart, and passes with this into the lungs, where it is consumed in the process of respiration; as little comparatively could be detected, in the healthy state, in the arterial blood of the pulmonary veins. The inference seemed necessary that the sugar passing from the liver was produced in that organ, which was therefore supposed to be endowed with a previously undiscovered function, very appropriately named the *glucogenic*. Now if the liver produce the sugar in excess beyond the consuming power of respiration, or if, from disease in the lungs, the normal quantity produced in the liver be not consumed, in either case, it is apparent that the sugar must enter the general circulation. From whatever source derived, being admitted into the circulation, it stimulates the kidneys to excessive action, and is thrown off with an increased amount of the other constituents of the blood, which escape the vigilance of the renal function, occupied with its great duty of eliminating the noxious matter. A great advance thus seemed to be made towards the discovery of the true pathology of diabetes; but subsequent experiments have rendered necessary some modification of the views then entertained.

The first step in the new direction was taken by M. Bernard himself, who discovered that the sugar leaving the liver is not generated directly by that organ, or extracted by it immediately from the blood, but is the result of the saccharine conversion of a starch-like substance generated in the gland. This conversion, moreover, was shown to be owing, not to any vital action of the liver on the amyloid matter, but simply to the chemical agency of some nitrogenous principle, acting as a ferment; as the change takes place in the liver when removed from the body M. Bernard, failing to detect the sugar in the blood of the left ventricle, while it was copious in the right, inferred that it was consumed in the lungs; and hence various speculations arose in reference to the agency of these organs in causing the phenomena of diabetes These, however, have been superseded by the experiments of M. Chaveau and Dr. Geo. Harley, who have shown that the saccharine matter really passes through the lungs, and enters the general circulation; having been detected by them in the left ventricle in very nearly as large proportion as in the right, so that very little is consumed in the respiratory organs, not more perhaps proportionally than in the system at large, through which it is distributed by the capillaries. (*B. and F. Medico-chir Rev.*, July, 1857, p 152.)*

Still later experiments of Dr Pavy appear to have thrown new light on this intricate subject, and to open the way towards a rational pathology in disbetes. He has shown that the conversion of the amyloid substance produced in the liver into sugar does not take place in that organ during life and in a healthy state. Indeed, from some recent experiments on the lower animals, he infers that, so far from the amyloid substance being normally converted into glucose, it is itself formed in the liver, in part, out of saccharine matter which reaches it through the portal veins from the food. (*Med. T. and Gaz.*, June, 1865, p. 566.) Instantly upon the removal of the organ or its blood from under vital influences, the saccharine change begins, and goes on with great rapidity; so that the function of the liver is not only to produce the amyloid matter, but also to guard it against alteration, probably to subserve some other important purpose in the economy. If speculation may be allowed in this somewhat unsettled state of the subject, it would seem to be the most rational explanation, that diabetes may have at least one of its sources in a suspension of this conservative influence of the liver, either through excessive congestion, or direct depression, or some organic change, by which the conversion of the amyloid matter into glucose is permitted to take place. Thus may be explained the excess of sugar in the blood, and all its consequences; and, moreover, the purposes which the amyloid substance is intended to subserve in the economy, which cannot but be important, are counteracted, and a new and hitherto unsuspected feature added to the pathology of the disease.*

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* Another interesting fact, which appeared to be demonstrated by Drs. Pavy and G. Owen Rees, is that the sugar formed in the liver, and thrown out by the kidneys in diabetes artificially induced, is different from the proper diabetic sugar or glucose in this respect, that it undergoes decomposition much more readily than the latter variety by contact with animal tissue. Hence the rapidity with which it is decomposed in health in the course of the circulation. (*Lond. Lancet*, Am. ed., Aug. 1857, p. 106.) Dr. Pavy inferred from these facts, that the morbid condition in diabetes is not the want of decomposing power in the lungs, nor necessarily the over-production of sugar in the liver, but the production in that organ of the diabetic or grape sugar or glucose, instead of the proper hepatic sugar. The former, entering the general circulation and not undergoing destruction as the latter does, is carried off by the kidneys, and produces the saccharine urine characteristic of true diabetes. Hence, the view of diabetes, according to this ingenious hypothesis, is that the liver has lost the power of generating genuine hepatic sugar or animal glucose, which is intended to subserve some important purpose in the animal economy, and is decomposed in the capillaries, and in its stead produces the saccharine principle variously called grape sugar, vegetable glucose, or diabetic sugar, which is incapable of fulfilling the office of the hepatic sugar, because not decomposable by contact with the animal tissues, and is therefore thrown off by the kidneys. (*Chem. Gaz.*, July 16, 1855.) This theory, however, seems to have been rendered inapplicable by the very interesting discovery afterwards made by Dr. Pavy, which is mentioned in the text. Andral states that, since the experiments of Bernard, he has examined five diabetic subjects after death, and found in all a peculiar state of the liver, consisting in an intense congestion of the organ, differing in appearance from its ordinary congestion: the liver being everywhere of a perfectly uniform redness, instead of the normal mixture of red and yellow. He supposes, therefore, that diabetes is owing to a peculiar congestive state of the liver, producing an abnormal activity of its sugar-producing function. (*Arch. Gén.*, Sept. 1855, p. 858.) Dr. Harley has shown that, by injecting ammonia or alcohol into the portal vein of a dog, the urine is rendered saccharine, and Bernard has obtained the same results from throwing alcohol and ether into the duodenum. These facts go to confirm the opinion of the excessive action of the liver in diabetes. But a wholly different explanation is rendered necessary by the later results of Dr. Pavy, stated in the text. It would seem that the excessive congestion of the liver has the effect of this same condition in all other organs when extreme, to repress function; and the change of the amyloid substance into sugar in the liver may be owing to a suspension or repression of its true function, which is to guard against the saccharine conversion of the amyloid matter. (*Note to the fifth and sixth editions.*)

The *amyloid substance* of the liver, or glucogene, which is supposed to be stored in this organ in the cells, may be obtained by boiling a portion of the liver in water, filtering the decoction, adding an excess of strong acetic acid, separating the glucogene which [illegible] precipitated, then dissolving it in water, precipitating it by absolute alcohol, and repeating the process till it is obtained pure. In this state it closely resembles starch, being white, without taste or smell, soluble in water, insoluble in alcohol and acetic acid, and transformed into glucose by heating it with a dilute mineral acid, or by contact with saliva or pancreatic juice. But it differs from starch in giving a reddish-violet colo[illegible] with tincture of iodine instead of a blue. (*Med. T. & Gaz.*, Sept. 1865, p. 359.)—*Note* [illegible] *the sixth edition.*

The vast discharge of fluid and solid matters by the kidneys provokes thirst and hunger, which, by leading to distension of stomach, increase probably the original digestive disorder; and the vital actions of assimilation and secretion thus go on in a vicious circle, which draws at length all the functions of the economy into its fatal vortex. The derangements already enumerated among the symptoms of diabetes are thus explained. Dryness of the skin necessarily follows the concentration of secretory action in the kidneys. Emaciation and debility tread naturally in the steps of an evacuation, beyond the reparative powers of the nutritive function. The depravation of the blood leads to organic derangements, such as tuberculous deposit in the lungs, and granular disease in the kidneys. At length the overtasked renal powers give way; the secretion of urine ceases; effete matters accumulate in the circulation; and, if life has not fled by some one of the numerous avenues before opened, it goes at last through the brain, which is paralyzed or oppressed by the impoverished or poisoned blood. To these sources of depravation of the system, may now be added whatever evil may result from the change of the amyloid product of the liver into sugar, and its consequent diversion from its legitimate office in the economy. Dr. Pavy has found that, by wounding the superior cervical ganglion of the sympathetic nerve, sugar was copiously discharged with the urine; whence it might be inferred that the diabetes results from an altered state of the blood-vessels of the liver; but he found that by tying the hepatic artery, the effect was not diminished. Have we, however, any proof that the portal capillaries are not as well under the sympathetic influence as those of the nourishing artery of the liver? (*Med. T. and Gaz.*, June, 1863, p. 566.)

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* It is proper here to state that the conclusions of Dr. Pavy as to the non-conversion, during life and in health, of the amyloid substance of the liver into glucose, in that organ, are not received by all the pathologists who have been working in this direction, and that with some the liver still retains its character of a sugar-producing organ, of which the generation of the amyloid substance, or *glucogene*, as they call it, is but the first step. But, after a careful review of the subject, I cannot see how Dr. Pavy's conclusions can be rejected, if the accuracy of his experiments, which I presume there is no reason to doubt, be admitted. It might seem favourable to the views of those who believe the liver to be a sugar-producing organ, that the injection of alcohol, ammonia, and other stimulants into the portal vein, as shown by Dr. Harley and others, causes an artificial diabetes. These stimulants simply, it is said, excite the glucogenic function of the liver, and thus cause an increased production of glucose, to be carried from the liver to the circulation, and thence through the kidneys into the urine. But, in accordance with Dr. Pavy's views, it may with great propriety be said that these stimulants, thus directly applied to the liver, irritated it so intensely, as, in accordance with one of the laws of irritation maintained in this work, that in excess it depresses function, to disable it from exercising its due powers over the amyloid substance, and thus to permit the conversion of that substance into sugar under mere chemical influences. I do not, therefore, conceive that these experiments are in the least degree an obstacle to the reception of Dr. Pavy's results, which appear to me to approach nearer the solution of the problem, offered by the connection of the liver with diabetes, than any other views that I have seen.—(*Note to the sixth edition.*)

Some pathologists recognize two varieties of diabetes; one, in which the sugar is produced in excess, beyond the assimilative powers of the system; the other depending upon a deficiency of the assimilating powers, so that the sugar, always existing in the circulation, is allowed to accumulate abnormally because no longer used for the purposes of nutrition. This idea is extremely plausible; and though, as yet, we are not possessed of the means of a precise diagnosis between the two varieties, we may infer that a case which resists all the measures usually successful in diminishing the production of sugar, as, for example, an exclusive animal diet, belongs very probably to the variety in which the cause of accumulation is a deficiency of assimilation. Of course, the idea of this difference of origin implies an accordance with the opinion, now apparently gaining ground, that glucose is a normal ingredient in the blood, and applied in the capillaries to certain purposes necessary or useful in the animal economy, one of these probably being the generation of fat.

Causes.—These are obscure. It appears to be generally admitted that hereditary tendencies, and certain natural or acquired conditions of the constitution in persons whose parents had never been affected with the disease, act as predisposing causes. Prout states that he has seen it more frequently in persons of light-reddish hair, and strumous constitution, than in others. A residence in cold damp situations, and in miasmatic districts, an impoverished diet, venereal excesses, and the abuse of mercury are said sometimes to have placed the system in a condition favourable to the occurrence of diabetes. The same is said of the excessive use of sugar. Among the exciting causes have been mentioned, exposure to cold, blows, or other violence on the back, the drinking of cold water when over-heated, anxiety or grief, and various diseases, especially rheumatism and gout, cutaneous eruptions repelled from the surface, and carbuncle or its allied affections. Dr. Prout states that, so far as his experience goes, carbuncle is always accompanied with diabetes. It must be confessed that all our knowledge of the causes of this complaint is exceedingly vague and unsatisfactory. It is most frequent in middle life, and is rare in infancy and old age. Sex appears to have no influence over it. Should further investigations prove the accuracy of the experiments by which the origin of the diabetic sugar may be traced to a defect in the process of digestion, as inferrible from the observation of McGregor, or to abnormal action of the liver, as suggested by the experiments of Bernard, Pavy, and others, we shall have advanced one step towards an understanding of the etiology of the disease. M. Bernard found that, by irritating the olivary bodies of the medulla oblongata, he could at any time increase the production of sugar, and cause its appearance in the urine. We may, therefore, look to the nervous system, as well as to the stomach and liver, as possible seats of the true disease in diabetes. In a fatal case occurring subsequently to the promulgation of the observations of Bernard, two dark spots were found in that part of the medulla oblongata, the wounding of which had been followed by the extraordinary effect above mentioned. (See *Am. Journ. of Med. Sci.*, N. S., xix. 185.) Since the preceding edition of this work was published, many other cases have occurred, in which diabetes has been traced to lesions, whether traumatic or otherwise, of various parts of the brain, spinal marrow, and nerves; and even functional disorder of these parts has occasionally caused the disease, as, for example, when it has happened as a result of strong mental emotion, excessive mental fatigue, and injuries to the abdominal viscera reflected to the nervous centres. M. Fritz, from extended researches into this subject, has drawn the following conclusions. 1. Diabetes may result from cerebral lesions whether traumatic or functional. 2. The precise seat or nature of the lesion necessary to this effect is unknown. 3. The diabetic effect in traumatic cases often precedes the occurrence of cerebral symptoms; and in functional disease it is apt to be attended with convulsions. The diabetes from this cause is usually of short duration, and in most cases curable. (*Gaz. Hebdomadaire*, A.D. 1859, No. 24.) It is very certain that the affection is often associated with organic disease of the liver, whether produced by this cause or not.*

Prognosis.—This is generally unfavourable. When the disease is submitted

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* *Relations of diabetes with the nervous centres.*—The relations of diabetes with the nervous centres form at present one of the most interesting parts of the subject; as a track is thus pointed out, which, if duly pursued, may possibly lead to a solution of the whole intricate question as to the etiology and nature of the affection. By the researches of M. P. Fischer, published in the *Archives Générales* (A. D. 1862, 5e sér., xx. 258 et 418), we are enabled to present a pretty full view of the subject as it now stands. Bernard, by pricking the floor of the fourth cerebral ventricle, in a space between the origin of the pneumogastric and that of the auditory nerve, induced saccharine diabetes. If the wound were made a little higher, the urine was less copious, and less loaded with sugar, but often contained albumen. If the medulla oblongata were pricked immediately below the origin of the auditory nerve, diuresis ensued, but neither saccharine nor albuminous. The sugar appeared, in these cases, about six hours after the wound, and disappeared in less than 24 hours. The division of the pneumogastric and great sympathetic nerves did not prevent the effect; the nervous influence, therefore, was conveyed by some other route than through these nerves; and this was probably through the spinal column.

But it was afterwards found that the wounding of other parts of the brain produced the same effect on the urine, as the peduncula and corpora olivaria, for example. A dog was killed by a blow on the head, fracturing the cranium. Coma followed the injury, and in two hours afterward sugar was found in the urine. M. Schiff produced intense diabetes in a dog by pricking the whole medulla oblongata; the sugar appearing in four hours, and continuing four days. The same result followed injury to the spinal marrow, by introducing a needle before and behind the origin of the nerves of the brachial plexus. The section of the anterior and lateral cords of the spinal marrow in rats, caused a persistent diabetes. By passing a galvanic current through the *liver*, or introducing an acupuncture needle into the organ, the same effect followed.

Dr. Pavy produced glucosuria by section of the nerves which accompany the vertebral arteries. The removal of a large ganglion in the upper part of the neck, which sends branches to the pneumogastric and to the carotid, caused intense diabetes. No other operation was so rapid or energetic in its effects. The division, however, of the thoracic part of the great sympathetic produced no such result.

Dr. Harley found that division of the branches of the pneumogastric going to the liver, arrested the formation of sugar; but by galvanizing the upper divided ends, the production of sugar was restored. No effect followed the stimulation of the lower ends. It thus seemed to be proved that the normal agency by which sugar is generated in the liver proceeds from that organ through fibres of the pneumogastric nerves to the nervous centre, while the reflected action causing the effect is sent by other nerves. (*Med. T. and Gaz.*, Sept. 1865, p. 357.)

The explanation of many of the foregoing results is rendered possible by the discoveries of Jacubowitsch. There are three orders of nervous cells corresponding with the three orders of nerves; the motor, the sensitive, and the sympathetic, all connected together by nervous filaments, and all maintaining their relations with the periphery by means of nerves. The existence of the sympathetic system within as well as without the spinal column has been established. Along the whole length of the cord is a gray substance full of the sympathetic cells, and their connecting nerves. The fascicle of gray matter reaching the floor of the fourth cerebral ventricle, finds its centre there, and dividing into filaments, radiates in various directions within the brain. This sympathetic system controls the actions of the capillaries, and thus influences secretions as well as other functions. The production of glucosuria through nervous agency may thus be accounted for. Impressions sent from various parts to the nervous centre are reflected thence through the sympathetic track to the nerves proceeding to the liver, and thus bring its glucogenic function into action. This may happen whether the morbid agency to treatment in its earlier stages, there may be some hope of affording permanent relief, though, when apparently cured, the patient is liable to a renewed attack from comparatively slight causes, and constant watchfulness is necessary during the remainder of life. Though the disease is cured, the predisposition remains. In many cases, where complete cures cannot be effected, much may be done towards moderating the symptoms and prolonging life. In the most advanced stages, treatment is of little avail. Upon the whole, though numerous instances of asserted cure are on record, the cases are remarkably few in which individuals, after having once had the disease and been restored to apparent health, are positively known to have continued exempt from it during their after life. Favourable symptoms, in any particular case, are a diminution in the quantity and saccharine quality of the urine, a density not exceeding 1 035, the appearance of uric acid in the secretion, a moderation of the thirst and hunger, improved spirits, and a gain in flesh. Unfavourable symptoms are excessive and unremitting diuresis, pale or albuminous urine with a density exceeding 1 035, insatiable thirst and hunger, extreme emaciation, and, above all, the evidences of organic disease of the lungs, liver, or kidneys. Any one of these symptoms is of serious import; the occurrence of many or all of them may be considered as rendering the case desperate. In no case should the disease be thought to be cured, while the saccharine quality of the urine remains, even though all the other symptoms should have disappeared.

Treatment.—In conformity with the pathological views above given, the indications of treatment are *first*, to prevent the formation of saccharine matter, which appears to lie at the very foundation of the disease; *secondly*, to diminish the amount of urine discharged, which, independently of its peculiar character, tends, by its excess, to impoverish and deprave the blood and to produce emaciation and debility; and *thirdly*, to alter the condition of the blood itself, which is probably the direct source of much of the functional and organic derangement which marks the progress of the disorder

1. To prevent the formation of sugar, we must alter the functional condition of the stomach, liver, or brain, from which it results, or must prevent the entrance into the system of materials out of which it may be elaborated. The first is obviously the most important object, and if accomplished would leave little more to be done. In reference to the stomach, we are unhappily as yet ignorant in what the gastric derangement consists, and therefore cannot strike at its root. By some it is considered a species of dyspepsia; but, in general, there does not appear to be a want of solvent power, and large quantities of food are often disposed of with little inconvenience. The most reasonable view appears to be that the secretory function of the stomach is perverted; and that, instead of the ordinary healthy gastric juice, or along with it, there is produced

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proceeds from parts without or within the cranium. These remarks are based on experimental researches; but clinical observations lead to the same result.

Thus, a strong moral emotion determines glucosuria probably by irritating the nervous centre through the sympathetic tissue radiating in the brain. Violent emotion, fear, or mental shock of any kind produces the effect: and the various cerebral injuries or diseases which have caused diabetes may operate in the same way. The same may be said of various functional disorders, as epilepsy hysteria asthma, &c, which have been known to be attended with glucosuria. Of 21 cases in which injury of the brain induced diuresis, 6 affected the forehead, 5 the vertex and parietal protuberances, and 5 the occiput. In 6 there was fracture, in 11 loss of consciousness, in 8 hemiplegia. In 4 out of the 21, there was only simple diuresis, in 8 slight glucosuria, in 6 temporary affection of the same kind, and in 8 confirmed diabetes Injuries exterior to the brain have had the same effect, operating no doubt through the nervous centres. Of such cases 8 arose from falls on the feet or face, 1 from violent shock, 4 from fractured vertebræ, 6 from blows on the back and loins, 2 from blows on the arms and chest, 8 from violent muscular effort, 1 from a blow on the epigastrium, 1 from contusion of the liver, and 1 from injury to the kidney. (*Note to the sixth edition.*)

some substance which, acting like a ferment, disposes to the generation of sugar, in an abnormal amount, out of the different forms of aliment, as diastase, generated during the germination of the potato, disposes to the production of sugar out of starch. It is reasonable to suppose that this perverted secretion may originate in a want of due gastric energy; and hence tonics are often employed, and sometimes not without apparent advantage. The simple bitters, quinia, and the chalybeates have had the highest reputation. These may be resorted to in any case in which the stomach exhibits no evidence of vascular irritation or inflammation. The preparations of iron are perhaps most suitable. Any one of these may be selected which agrees well with the stomach. The pill of carbonate of iron, the tincture of the chloride, or the solution of the iodide, will usually answer well. The iodide and the phosphate have been recommended as having peculiar efficacy; but this is doubtful. Cod-liver oil has been employed with apparent advantage, and may be supposed to act favourably by invigorating the assimilative functions. At the same time, the bowels should be kept regularly open; and, for this purpose, aloes and rhubarb, or the compound extract of colocynth, may be employed, either combined with the chalybeate, or given separately, as circumstances may render most expedient. The acrid and saline purges should, in general, be avoided; the former as too irritating to the bowels, the latter as endangering an increased diuresis. Castor oil has been recommended; but few stomachs will bear it, with that frequency of repetition which is often necessary. Emetics have sometimes been thought to do much good; and cures are asserted to have been effected by them. It is possible that, occasionally repeated, they may tend in some unexplained way to correct the gastric perversion; but experience has not spoken with sufficient decision to justify a reliance upon them. The opinion has been advanced, that the acids, which are not unfrequently present in the diabetic stomach, may dispose to the conversion of other principles into sugar, as some of the same class of substances are known to do out of the body, when aided by sufficient heat. Injection of phosphoric acid into the blood is said by Dr. Pavy to have induced artificial diabetes. (*Guy's Hosp. Rep.*, A. D. 1861, p. 210.) Whether this be so or not, the alkaline remedies are among those which are thought to have done the most good.* Magnesia and carbonate of ammonia, separate or together, have probably been most effectual, and cures have been repeatedly ascribed to them. Dr. Trotter, who found pure magnesia peculiarly useful, gave it in the quantity of two drachms daily. Five grains of the carbonate of ammonia may be given four times daily, and gradually increased to eight or ten grains. Bicarbonate of soda has been highly recommended in the dose of half a drachm, increased to a drachm, three times a day. Lime-water has also enjoyed much reputation, and is sometimes given with milk as drink and food. The alkaline salts with vegetable acids, as acetate of potassa, answer the same purpose, and may be used unless found to act injuriously by their diuretic properties. To be effectual, the alkaline plan must be continued for weeks or months. It should be persevered in, so long as the quantity and saccharine quality of the urine appear to diminish under its use. If, on the contrary, the urine appear to be increased by any one of the antacids used, it should be changed for another, or the plan abandoned.

Experience has not yet taught us what measures may be expected to correct the diseased condition of the liver, which there is reason to believe is so much in fault in the production of diabetes. The success asserted to have been obtained by the use of ox-gall in diabetes may be conjecturally ascribed to its influence on the hepatic function. A case of cure is recorded, effected in four weeks by the use of twenty ounces of this medicine. (See *Nordamerik. Monatsbericht*, &c., i. 23.) If we admit the probable correctness of the views already offered of the influence of the liver in the pathology of diabetes, we are at once pointed to a mode of treatment which has a rational basis in its favour. Should the state of the liver interfering with its functions be that of extreme congestion, general and local bleeding, mercurial cathartics, and blisters over the organ might be indicated, and carried into effect unless obviously contraindicated by the state of the system. Should the liver, on the contrary, be torpid, a gentle mercurial course, or the use of nitromuriatic acid, and other admitted stimulants of the liver, would be suggested. From the connection which both experiment and clinical observation have proved often to exist between diabetes and morbid states of the nervous centres, it is obviously important, in the treatment of the disease, to examine carefully into the state of the brain, spinal marrow, and sympathetic ganglia, and if any derangements which remedies can reach are discovered, to employ the requisite measures. Thus, leeches, or repeated blisters to the back of the neck, may be indicated in some instances, and even the ice-bags of Dr. John Chapman to the back of the neck, or over the upper dorsal vertebræ, may not be without occasional advantage; and it will be noticed, further on, that some remedies formerly used on the grounds of experience alone, have with our present views a rational basis for their support.

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* Dr. Pavy found that injection of carbonate of soda into the circulation prevents the artificial diabetes arising from wounds of the sympathetic nerve or otherwise; and that, if injected into the portal vein so as to circulate with the blood through the liver, it prevents the urine from becoming saccharine. In like manner, its presence in the liver prevents the saccharine change which usually takes place after death. (*Braithwaite*, No. 45, p. 96.)

While the above measures are in operation, it is highly important to attend to the second object under this indication; namely, to prevent the access to the stomach of those substances which are most liable to be converted into sugar. The regulation of the diet is indeed absolutely essential. It is necessary gradually to restrain within moderate limits the quantity of food and drink taken, so as not to weaken or irritate the stomach by over-distension, or over-dilution. Little drink should be taken at meals, at least no more than is indispensable for the comfort of the patient. The urgent sensation of thirst may often be as well appeased by washing the mouth and throat with cold acidulated drinks as by swallowing them. Some recommend that the drinks be taken warm, in order to remove the temptation to excessive indulgence. Pure water or carbonic acid water, and, in cases of debility, good sound porter, diluted or otherwise, may be used. Excess in eating must be equally avoided. Death, in one or more instances of this disease, has been traced immediately to undue indulgence of a ravenous appetite.

The quality of the food is all-important, and, without attention to this point, cures can scarcely be effected. Those substances only should be allowed which are least capable of conversion into sugar. Dr. Rollo was the first to carry out effectually the plan of confining the patient to a diet exclusively of animal food. The plan was found highly beneficial, and, with some modifications, is now almost universally admitted to be essential. Numerous cures are on record effected in this way. It is true that Dr. McGregor found sugar in the diabetic stomach, even after a diet of beef and water continued for three days, and Bernard ascertained that, with a similar exclusive diet, the liver still produced glucose; but the quantity was much less than under other circumstances, at least in McGregor's experiments; and there can be no doubt, as well from our knowledge of the chemical relations of the organic proximate principles, as from extensive and careful observation, that an exclusively animal diet is a powerful corrective of the morbid production of sugar, and will very often diminish, if it do not altogether correct the saccharine impregnation of the urine. To be effectual, however, as a curative measure, it must be long persevered in, so that the stomach or liver may lose the morbid habit which it had previously acquired. It often happens that a single violation of the exclusive rule, on the part of the patient, leads to a return of the complaint; and, even after cures have been apparently effected, a long and careful watchfulness over the diet is necessary to prevent a relapse. The particular articles of diet admissible are the easily digestible meats, cream, cheese, butter and oil, soft-boiled eggs, fish, and oysters. Milk was formerly allowed; but Bouchardat, who has had great experience in the treatment of this complaint, forbids it; and the quantity of saccharine matter it contains justifies its exclusion. Salt meats are to be excluded as liable to provoke thirst. But a diet exclusively of animal food is generally distasteful, and often becomes at length absolutely disgusting to the patient, so that it is almost impossible for him to adhere to it; and very few will be found who will not occasionally resort to other food. Some practitioners permit the use of bread; but, as this contains a large proportion of starch, which is one of the substances most easily converted into sugar, it is obviously improper; and experience has shown that the animal diet, with this latitude, seldom proves effectual. Bouchardat employs a bread made from the gluten of wheat flour, after the starch has been washed out. It requires, in order to be made into light bread, to be mixed with about one-sixth of its weight of flour; and the addition of bran would probably be useful by dividing the nutritive matter, and at the same time acting as a laxative.* Dr. Pavy recommends, as a substitute for bread, almonds prepared in the form of biscuit; the sole ingredients being eggs and powder of blanched almonds, previously freed by washing from gum and sugar. The green vegetables, such as spinage, celery, parsley, and more especially those belonging to the cruciferæ, as cabbage, water-cress, sea-kale, and the young tops of the radish and turnip, are said not to be liable to the saccharine change, and to be eaten with impunity by diabetic patients. These, therefore, may be tried in connection with the animal food, and persevered in if not found to be injurious. Coffee and tea, without milk or sugar, have been recommended from their highly azotized composition; but their known injurious influence in dyspeptic cases renders them of doubtful applicability here. Bouchardat recommends the lighter wines, particularly claret, which he gives very freely. On the same authority, beer and the acid drinks are objectionable. The patient should eat and drink slowly, masticating his food thoroughly. Such exercise as the strength will permit is important, in order to sustain a due vigour of digestion.†

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* A bread containing no starch has been made from potatoes, and used with asserted advantage. The following is the recipe. Take sixteen pounds of potatoes, previously rasped and washed free from starch, three-quarters of a pound of mutton-suet, half a pound of fresh butter, twelve eggs, half an ounce of carbonate of soda, two ounces of diluted muriatic acid. Mix the ingredients; divide the mass into eight cakes, and bake quickly until browned. (See *Am. Journ. of Pharm.*, xxi. 242.)

Mr. J. M. Camplin has found great benefit from bread and biscuit made of bran. This is first washed thoroughly, then dried, ground in a fine mill, and sifted. To prepare the bread, take three ounces troy of the bran thus prepared, three fresh eggs, an ounce and a half of butter, and rather less than half a pint of milk. Mix the eggs with part of the milk, and warm the butter with the other portion; then stir the whole well together, adding a little nutmeg or ginger. Immediately after putting into the oven, stir in thirty-five grains of bicarbonate of soda, and then three drachms of diluted muriatic acid, and bake for an hour or more. (*Med. Times and Gaz.*, May, 1857, p. 482.)

† In experimenting on dogs, Bernard found that by feeding them exclusively on fats, as on the fat of bacon and lard, the sugar produced in the liver was diminished, and in the same proportion as if the animal had been fasting. He explains this by supposing that fatty substances are absorbed directly by the lacteals, and consequently do not enter the liver. The practical deduction is that such substances are suitable articles of diet for diabetic patients, and that cod-liver oil is likely to be useful, if in no other way, at least by taking the place of other articles which must enter the portal circulation, and afford material to the liver for the formation of sugar. (*Note to the fifth edition.*)

2. Were the measures employed to meet the first indication speedily successful, there would be no occasion for further treatment; for, the root of the evil being eradicated, all the resulting derangements would cease of course, and the patient be restored to health, unless incurable organic diseases should have set in. But, unfortunately, the operation of these measures is often slow, and by no means uniformly successful even with time; so that it becomes necessary to control the secondary morbid actions, and obviate the mischief that must otherwise ensue. Hence arises the second indication, that, namely, which points to the diminution of the amount of urine. For this purpose, as well as in reference to the condition of the stomach, the regulation of the drinks becomes necessary. The attempt should not be made to reduce these at once to the lowest ultimately desirable point; for serious injury might result to the constitution from the sudden disturbance of a sort of equilibrium, which nature has established. But the end should be accomplished by slow degrees, and here it is highly important that the patient should honestly and zealously second the views of the practitioner. Of course all diuretic drinks should be immediately abandoned.

Of the medicines calculated to diminish the discharge of urine none is so efficacious as opium. The great advantages to be derived from this remedy are admitted by almost all. It not only very frequently diminishes the flow of urine, but also quiets the nervous irritation of the patient, and renders him much more comfortable. It does not, however, alter the saccharine character of the urine, and is, therefore, of itself, inadequate to the cure of the complaint. It is only one of the most valuable, perhaps the most valuable of the secondary means. It should be given so as to keep the system moderately under its influence, and care should be taken to prevent a too rapid increase of the dose, or the establishment of a bad habit on the part of the patient. It is, therefore, best to administer it in such combinations as to conceal its character, and to lead to unpleasant sensible effects if it should be abused. These purposes are answered by the addition of ipecacuanha or tartar emetic, which, while in overdoses it would be apt to excite nausea or vomiting, will in the proper quantity be found directly useful by giving the medicine a direction to the skin. From half a grain to a grain of opium with an equal quantity of ipecacuanha, or one-sixth of the quantity or less of tartar emetic, may be given at intervals of six or eight hours. Sometimes it may be thought best to give from ten to twenty grains of Dover's powder at bedtime, and none in the course of the day.

Another means of meeting the second indication is to excite action in the surface, and restore, if possible, the perspiratory function. This should be attempted by the wearing of flannel next the skin, by friction with the flesh-brush, by the warm or hot bath, vapour bath, or hot-air bath, by bodily exercise, and by the use of diaphoretics. Of the diaphoretics none is so efficacious as the Dover's powder already mentioned. Carbonate of ammonia is sometimes useful. The saline diaphoretics, such as citrate of potassa, acetate of ammonia, and nitrate of potassa, are of doubtful propriety, in consequence of an occasional tendency to excite the kidneys.

To answer the same indication, astringents have often been employed, and sometimes with supposed advantage. Kino, catechu, krameria, alum, the sulphates of iron, zinc, and copper, and acetate of lead may be tried. It is highly probable that the excessive diuresis may be sometimes at least dependent upon a relaxation of the kidneys; and substances having a directly stimulant action on these organs may prove beneficial. A cure is recorded by M. Demeaux, which was apparently effected by the use of equal parts of calcined alum and extract of rhatany. (*Gaz. Médicale*, No. 31.) Upon this principle it probably is, that the turpentines and cantharides sometimes lessen the flow. Cures of diabetes have been ascribed to the latter of these medicines. Creasote, also, has been highly recommended. In one severe case, I have seen it exercise apparently considerable influence over the amount of secretion; but it had no effect in checking the disease.

3. By the loss of its water and salts through the kidneys, as well as by the imperfect assimilation of the nutriment thrown into it, the blood becomes depraved, having an excess probably of the fibrinous and colouring ingredients; as the fluid absorbed scarcely keeps exactly even pace with that discharged. Hence, probably, the scorbutic phenomena; and hence too the tendency to various organic derangement, which marks the advanced stages. Bleeding is the best palliative for this state of the blood. It tends to restore the equilibrium of the constituents; for the place of the blood abstracted is supplied with water and salts in larger proportion than with the animalized products. Nor does it materially weaken the patient. The vigour of the appetite, and the nutritious character of the food used, serve to obviate this result. The consequences are usually great relief to the uncomfortable feelings of the patient, a diminution of any inflammatory symptoms that may exist, and a reduction in the quantity of the urine. The bleeding may be repeated occasionally to the amount of ten or twelve ounces, as the system may be found to bear it. The remedy is not applicable to the latter stages of the complaint, nor to cases attended with marked debility from the outset; and should be abstained from if found to weaken the patient.

The above treatment is that which experience has pointed out as the most efficient, and which the nature of the affection appears to call for. Various other remedies have been recommended. *Mercury* has had its advocates; but the general opinion is at present adverse to it, unless as a mere alterative when the hepatic function is obviously deranged. I am disposed, however, to think it applicable, in reference to its effects on the system, to those cases in which the origin of the disease may be traced, with some probability, either to chronic inflammation or persistent torpor of the liver. The *alkaline sulphurets* were employed by Rollo, but have not been found peculiarly useful upon subsequent trial, and have been abandoned. *Hydrocyanic acid* and *camphor* have enjoyed credit with some, and are probably not without utility in the control of irregular nervous symptoms. *Phosphate of soda* is said to have cured the complaint, but at best must be considered as a doubtful remedy. It may possibly be useful by supplying the loss of saline matter by the blood. *Strychnia, colchicum, iodide of potassium, permanganate of potassa,* and *sulphuret of arsenic* are also among the medicines which have been proposed. Dr. Frick, who tried the effect of various remedies in relation to the quantity of sugar, found strychnia to diminish it far more than any other, while cod-liver oil increased it, in whatever mode administered. (*Am. Journ of Med. Sci*, N. S., xxiv. 72.) A case has been recorded which rapidly improved under the use of *chloride of arsenic*, the solution of which was given in the dose of five minims, with infusion of cascarilla, three times a day. (*Lancet*, Oct. 1864, p. 437.) The *hot-air bath* seems to have had the effect, in one severe recorded case, of restoring the patient to perfect health. (*British Med. Journ.*, Nov. 3, 1860.) Dr. John Chapman recommends ice to the back of the neck and between the shoulders. (*Med. T. & Gaz.*, Oct. 1863, p. 404.) It has even been recommended to employ sugar and glycerin as articles of diet; and cases are asserted to have improved under their use; but the propriety of even experimenting with them, is, to say the least, very doubtful.

Dr. James Gray, of Glasgow, has employed rennet with success; and the practice has been imitated with asserted advantage; but it has generally failed altogether. The object in using this remedy was to convert the sugar formed in the primæ viæ into lactic acid; an effect which it has the property from the occurrence of complete suppression, the patient sinks into coma, and dies soon afterwards in the midst of repeated convulsions. Should small quantities of urine continue to be secreted, the disease may run on for weeks; but, unless relieved, it terminates at last in a gradually deepening coma. Dissection has revealed, in these cases, various conditions of the kidneys. In general, they have been more or less congested, sometimes atrophied, or enlarged, or indurated; and occasionally the seat of disease has proved to be in the surrounding adipose tissue, which has been found congested, inflamed, and even gangrenous. Effusion has been observed in the ventricles and on the surface of the brain, and the liquid has emitted a urinous smell. Urea has been detected in the blood in some cases of complete suppression. The affection has generally been considered to be a paralysis of the kidney. It probably has its origin, for the most part, either in some disease of the nervous centres, which prevents the due innervation of the kidneys, or in vascular congestion of these organs, overwhelming their secretory powers. Exposure to cold has been accused as the exciting cause. In elderly people the affection is sometimes ascribed to gout, and in children to dentition. It occurs most frequently in persons beyond middle age, and is especially apt to attack men of a somewhat robust or corpulent habit. It occasionally affects infants.

But suppression of urine is much more frequent as an attendant and result of other diseases. Inflammation or intense vascular irritation of the kidneys is often accompanied with great deficiency of the secretion, which is then of a fiery redness, highly acrid, and scalding in its passage through the bladder and urethra. Sometimes only a few drops of this kind of urine pass at a time; and in some very rare cases it is quite suppressed, with the most serious consequences. A species of febrile ischuria, which not unfrequently occurs in infancy, and sometimes in old age, may be considered of this character. The same may be said of that which results from poisonous doses of acrid substances, such as cantharides and corrosive sublimate. Gout, too, is often the cause of this species of ischuria. The urine which passes in these cases is apt to be loaded with uric acid.

Another kind of suppression is that which, in a greater or less degree, attends acute inflammations and idiopathic fevers. The urinary appears to participate in the torpor or constriction which affects the other secretory functions. In consequence of its great concentration, the urine is often of a deep-red colour. Suppression more or less complete occurs in certain forms of dropsy, and is sometimes the immediate cause of death both in the early and the last stages of Bright's disease. Calculous concretions in the pelvis of the kidneys, and obstruction of the ureter, have been before alluded to as causes of this affection. It is occasionally among the innumerable complications of hysteria, and has been known to follow severe surgical operations with fatal effect. Sometimes, too, it may be traced to cerebral or spinal disease. In the epidemic cholera, there is occasionally a total absence of urine for days together.

From whatever cause proceeding, suppression of urine is usually characterized by the general symptoms before enumerated as occurring in the idiopathic affection. If it be complete for several days, and coma supervene, it is almost certainly fatal. The cause of death is generally supposed to be the depressing and poisonous action upon the brain of the urea accumulated in the blood, in consequence of its being no longer eliminated by the kidneys. It is surprising, however, under how small a daily discharge life may be prolonged, and ultimately preserved. In some instances, too, other organs appear to take on a vicarious office, and to relieve the system by throwing off the urea. Thus, in epidemic cholera, in which the urinary secretion is sometimes entirely arrested, the brain remains remarkably clear, in consequence, no doubt, of the copious discharges from the skin and alimentary mucous membrane. Numerous cases are on record in which the urinary secretion has been wholly arrested for days, weeks, or months, without serious disturbance of health. In these, there have generally been liquid discharges from the stomach, bowels, or skin, which have sometimes had a urinous smell.* Repeated instances have also occurred in which pints or quarts of fluid, smelling like urine, are said to have been discharged from the mouth, axilla, external auditory meatus, umbilicus, and mammæ. Accounts, apparently well authenticated, have been given of persons who have passed no urine for a long time, perhaps not from birth, and yet have not seemed to suffer. In these last cases, however, it is probable that, from disease or malformation, the kidneys have communicated with the bowels, and the urine escaped with the feces. In the other cases, it is difficult to pronounce a positive opinion. They have generally occurred in females; and there can be no doubt that the observers have often been deceived by the insane cunning, with which some hysterical women are prone to impose upon the credulity of those about them, in relation to affections of the urinary and sexual organs. Instances have occurred in which such deception, after having been long successful, has been detected at last by careful watching; and it is fair to presume that others of a similar character have existed, which have either not been thoroughly scrutinized, or have eluded the scrutiny. Nor is this sort of insanity, or a disposition to deceive for purposes of convenience, confined to females. Male malingerers are not unfrequent in hospitals. Yet, making all due allowances for these cases, it would be difficult to deny credence to some of the published accounts of vicarious urinary discharges; and *a priori* there is no more reason to doubt the possibility of life being saved, in cases of suppression of urine, by the discharge of urea through some other than its normal emunctory, than that a similar result should take place in jaundice, in relation to the colouring matter of bile. An explanation of the variable results from the accumulation of

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* From experiments by MM. Bernard and Barreswil on animals, it appears that, after extirpation of the kidneys, salts of ammonia may be detected in the intestinal secretions, and that, while they continue to be present, the animal exhibits no evidence of the poisonous effects of urea. The inference is that urea is thrown out into the bowels, and there decomposed into salts of ammonia. (*Note to the second edition.*)

In experiments performed by Dr. Hammond, of the U. S. Army, the injection of urea into the circulation in dogs, if the kidneys remained, was followed by no serious consequences; while, if these organs were extirpated, speedy death resulted. (*N. Am. Med.-Chir. Rev.*, March, 1858, p. 293.) Subsequently, however, on repeating the same experiment, he found death to result in at least one instance, in which about 77 grains were injected into the veins. In this instance there was no excretion of urea after the injection. After extirpation of the kidneys, or tying of the renal vessels in dogs, there was at first little observable effect, but after a short time loss of appetite came on, followed by nausea and vomiting, and in the end by convulsions and coma, which terminated in death. The membranes of the brain were intensely congested, with effusion into the arachnoid cavity; the out surface of the brain had a pinkish hue, and exhibited many red points; the venous sinuses were turgid; there was effusion in the ventricles; the lungs were congested, with slight effusion in the pleural cavity; the pleura appeared as if in the commencement of inflammation; the peritoneum also exhibited signs of inflammation; the spleen was enlarged to thrice its normal bulk, and seemed disorganized and semifluid; the liver also was enlarged; the stomach exhaled an ammoniacal odour; the amount of urea in the blood was increased threefold, and there was no evidence that it had been in any degree converted into carbonate of ammonia; and, finally, perhaps the most interesting result of all, the red corpuscles were changed in form and diminished in number, while the white were greatly increased. (*Am. Journ. of Med. Sci.*, Jan. 1861, p. 55.) These results of Dr. Hammond, corresponding, as regards the symptomatology, so closely with the symptoms of suppression of urine in the human subject, prove conclusively that the retained excrementitious matters, usually thrown off by the kidneys, produce fatal results; but they do not prove that these results are the effects of urea alone, whether unaltered or decomposed; while, in connection with other experiments, they prove conclusively that ammonia is not the cause of the phenomena, as conjectured by Frerichs. (*Note to the sixth edition.*)

[illegible] doctrine, recently advanced by Frerichs, [illegible] the poisonous effects, but the carbonate [illegible] position. and this decomposition may or [illegible] may not be a substance in the [illegible] upon the urea. Now, without admitting [illegible] agent, we may admit the gen- [illegible] from the urea, but from the products of [illegible]

[illegible] it is important to begin with treat- [illegible] may be good hope of saving the patient. [illegible] the arm as freely as the strength will permit; [illegible] small of the back. At the same time, [illegible] jalap and cream of tartar, senna and [illegible] having a tendency to act as well [illegible] A small addition of elaterium or gamboge, [illegible] would probably be advantageous. Vigorous [illegible] Perhaps the most efficacious is bitar- [illegible] quantity of an ounce or two in divided doses [illegible] nitre, and the spirit of nitrous ether [illegible] ation, and in as large doses as the system [illegible] a blister may be applied upon the small [illegible] the spine, and repeated when the surface ceases [illegible] recommended the more stimulating diuretics, as [illegible] and they may possibly prove useful when [illegible] kidneys; but it should be borne in [illegible] are capable of producing sup- [illegible] or hot-air bath, and Dover's [illegible] by effecting a vicarious discharge [illegible] currence of coma, while they [illegible] le these organs to feel the im- [illegible] them. While these measures [illegible] to drink mucilaginous liquids, [illegible] wild-carrot, spirit of nitrous [illegible] high-coloured, and loaded with [illegible] than bicarbonate of soda, [illegible] three drachms in twenty-four [illegible] acid water. The diet should, [illegible] rely.

[illegible] kidneys, after due depletion, no [illegible] bath, above referred to. It not [illegible] the copious perspiration it in- [illegible] from the interior organs, acts [illegible] glands, and thereby enabling [illegible]

[illegible] of suppression, attended with clear [illegible] the urinary passages. In many of [illegible] scarcely passes the bound- [illegible] push the depletory measures [illegible] nates, aided by the spirit of [illegible] free use of mucilaginous drinks, [illegible] occurs in infants, will in general [illegible]

[illegible] affections of the brain or spinal [illegible] parts especially; and, besides [illegible] bleeding and blistering should be [illegible] the seat of the disease.

In those instances of suppression which occur in the last stage of disorganization of the kidneys, whether from ordinary inflammation or Bright's disease, little good can be expected from remedies; and the physician will confine his efforts to palliation.

Article X.

LITHIASIS.

Syn.—*Gravel.*—*Calculous Disease.*

LITHIASIS (from the Greek λίθος, a stone) is characterized by the deposition from the urine, within the body, of insoluble matter, in the form of impalpable powder, minute crystalline particles like sand, or solid concretions of various magnitude, with irritation or inflammation of the urinary passages.

In its most healthy state, the urine is transparent when discharged, except a slight cloudiness from mucus and epithelium scales, and remains so after cooling, until decomposition begins. But not unfrequently, from slight excesses in eating or drinking, some peculiarity of diet, or some fugitive impression that can scarcely be considered morbid, the urine, though transparent when evacuated, becomes turbid on cooling, and deposits a sediment of amorphous or imperfectly crystalline matter. When temporary, or productive of no considerable inconvenience, this is not looked on as a disease. It is, on the contrary, a method by which the system frees itself from superfluous matters, which might otherwise occasion trouble. But, when the deposition continues long, or recurs frequently, and especially if the urine be turbid at the time of discharge, it should be regarded as suspicious, even though no present inconvenience may be experienced; for, so long as this state of urine remains, there will be a liability to gravelly or calculous deposition within the body, and consequent disease of the urinary organs.

The sediment may be either 1. an amorphous powder without grittiness, 2. a sandy matter consisting of minute crystalline grains, of a gritty feel, but not distinctly visible, or 3. amorphous or crystalline concretions, sufficiently large to be readily distinguished by the eye, and denominated calculi. Morbid effects in the urinary passages proceed in general only from the two latter kinds of sediment. The presence of an impalpable powder in the urine is of consequence merely as it indicates a disordered state of system or of the urinary organs, or a liability to the occurrence of the other forms of deposition, or as confirmatory of other evidence of the existence of a calculus in the body, and affording the means of ascertaining the character of the calculus.

The chemical nature of the sediment is very different in different cases. All the deposits, however, may be arranged under the three heads of 1. *uric acid, or the urates;* 2. *the phosphates;* and 3. *oxalate of lime.* As each of these is consequent upon a peculiar state of system or of local disease, and attended, in a certain degree, by peculiar symptoms, they will be most advantageously treated of separately, so far as regards the deposition itself and its causes. The morbid effects of the several deposits, as they are closely analogous, will be treated of conjointly; and the same course will be adopted in relation to the treatment. The carbonate of lime, and cystic and xanthic deposits, are too rare to require particular notice in this place.

Uric Acid Lithiasis.—*Lithic Gravel.*—*Lithuria* (Willis).—This is much the most common form of gravel, and is highly important as in most instances the foundation of stone in the bladder. Different opinions have existed as to the precise nature of the deposit. At first supposed to be amorphous uric acid, it was afterwards, on the authority of Dr. Bird, believed to consist mainly of urate of ammonia, and is now determined by Lehmann, Heintz, and others, to be urate of soda, mixed with a very little of the urates of lime and ammonia. The probability is that it varies much with the condition of the urine, and that uric acid, or either of the urates mentioned may, under varying circumstances, be the predominant ingredient. The urate of potassa has also been noticed. These salts, when quite pure, are colourless; but, as deposited in the urine, they have almost always some shade of yellow or red; being frequently salmon-coloured like brickdust, and therefore called *lateritious*, sometimes yellowish, and sometimes, though more rarely, pink. So constant is the association, that the reddish colour of the deposit is one of the characteristic signs of the uric acid lithiasis. The colour is owing to some organic colouring principle or principles in the urine, which appear to have a strong affinity for uric acid and its compounds. It is not certainly ascertained in what state the uric acid itself exists in urine. According to Prout, one part of this acid requires one thousand parts of water at 60° for solution; and the highest solubility which has been allowed to it will not account for the proportion in which it is often found in the urine. Dr. Prout supposed that it was held in solution by combination with a proportion of ammonia insufficient to prevent its acid reaction, and yet sufficient considerably to increase its solubility, the urate of ammonia being much more soluble than the uncombined acid. There is no doubt that the urine does sometimes contain this salt. But there is reason to think that the acid may also be held in solution in consequence of its affinity for the colouring matter of the urine; as it is frequently deposited without ammonia, and it has been ascertained that, though almost insoluble in pure water, it is dissolved by water to which the colouring matter has been added. (See *Willis on Urinary Diseases.*) But, whatever may be the state in which uric acid exists in the urine, the fact appears to be, that it is precipitated by the addition of other acids. Urate of soda is occasionally observed in urinary deposits nearly colourless; but it is comparatively rare in this state. The deposit may be considered as belonging to the uric acid class, when it is readily dissolved by solution of potassa, and is insoluble in dilute muriatic acid. Should an ammoniacal odour be developed during the action of potassa, it would indicate the presence of urate of ammonia. Dr. G. O. Rees mentions, as a test of uric acid, that it is dissolved by nitric acid with effervescence, and, when the solution is carefully evaporated to dryness, yields a pink colour, which assumes a violet tint upon the addition of ammonia. (*Analysis of the Blood and Urine*, Am. ed., p. 73.)

The urine, during the existence of the complaint, is usually high-coloured, and more or less diminished. It is often very scanty. Its density does not upon the whole vary much from that of health. Dr. Willis found the sp. gr. frequently between 1·020 and 1·022; but in some cases of very scanty urine it is much greater, reaching even to 1·033, when the urine abounds in urea, as well as in uric acid or urate of ammonia. When first passed, the urine is often clear; and sometimes the deposition takes place, after cooling, without much if at all disturbing its transparency. But generally it becomes turbid on standing, and not unfrequently, when heavily loaded, comes away more or less turbid from the bladder. The deposit sometimes, though rarely, consists exclusively of crystalline sand. More generally this is mixed with a large proportion of amorphous impalpable matter; and now and then small concretions of the size of a pin's head or larger may be observed.

The deposition which takes place out of the body, when the urine cools, is owing to the saturated state of the solution, and the diminished solvent power at a reduced temperature. But this cannot be the cause of deposition in the body; as the temperature does not vary. It has been stated that the addition of an acid to urine, in this complaint, produces precipitation of uric acid. It is highly probable that such an addition occasionally takes place in the kidney, which, after having secreted urine saturated with uric acid into the tubules, may throw out from the Malpighian bodies lactic or free phosphoric acid, which may then act as the precipitant. A crystalline deposit, having once occurred, serves as a nucleus which may sustain a precipitation in the saturated fluid, without the further addition of an acid.

It is obvious, therefore, that whatever produces an excess of uric acid in the circulation, or occasions the secretion by the kidneys of another acid when the urine is saturated with uric acid or urate of ammonia, or neutralizes any alkali which might otherwise be secreted by the kidneys and render the uric acid more soluble by combining with it, may serve as the cause of an attack of this variety of gravel. Whatever materially diminishes the quantity of urine may have the same effect, by rendering the solution too concentrated. Hence the frequent association of scanty and high-coloured urine with the disposition to deposit uric acid or the urates. Among the causes which act most powerfully in producing an excess of uric acid is the use of much high-seasoned animal food, conjoined with indulgence in wine or other alcoholic drink, and at the same time with habits of indolence. An amount of azotized matter is thus introduced into the system beyond its wants, and the preliminary process of digestion is stimulated into over-exertion, so that the food, instead of being thrown off by the stomach or bowels, is carried into the blood. Thus overloaded, and not relieved by the demands which vigorous exercise usually makes upon it, the blood must find some other outlet for its excess of azotized matter, which therefore escapes by the kidneys, in part at least, in the shape of uric acid or urate of ammonia. It was formerly supposed that an exclusive vegetable diet predisposed to this disease; but the contrary has been established by the experiments of Magendie and others. Yet, in an individual whose urine is loaded, from the causes already mentioned, with a superabundance of uric acid, acescent vegetable food, especially connected with a dyspeptic state of stomach, may strongly aid in inducing an attack of gravel. This it does by the generation of an acid, probably the lactic, phosphoric, or muriatic, which, entering the circulation, may be secreted by the kidneys, and thus cause a precipitation of the uric acid, or may neutralize any alkali in the blood, which might otherwise pass out with the urine, and maintain the uric acid in solution. Hence, attacks of uric acid gravel may be very frequently traced to the use of indigestible and acescent food or drink, such as heavy dumplings, pastry, cheese, sour fruits or vegetables, acescent wines, &c., combined with an excess of rich meats, stimulating drinks, and deficient exercise.

But there is also not unfrequently a strong constitutional tendency to the disease, which occasions it to appear in certain individuals from causes which have no effect on others; so strong, indeed, in some instances, that the complaint appears, notwithstanding the greatest care to shun its exciting causes. This tendency is often hereditary, and often associated with gout. Indeed, there seems to be a close connection between the gouty and uric acid diathesis. Uric acid gravel is exceedingly common in gout, and the deposition of urate of soda in the joints is another evidence of the strong tendency, in that complaint, to the generation of an excess of uric acid. The similarity, one might say the identity, of the causes of the two affections, is another proof of their close relationship. It is said that infants, whose parents have suffered from gout, are apt to be attacked with this form of gravel or calculus.

Fevers of a sthenic character, and inflammations producing fever, are frequently attended with a scanty high-coloured urine, which, as the complaint passes off, is apt to deposit a copious lateritious sediment. This may readily become the origin of an attack of gravel; and the complaint does in fact frequently originate in a febrile condition of the system. An inflammatory condition or vascular irritation of the kidneys is apt to induce scantiness of urine, and to develope gravel in those predisposed to it. The probability is that the result flows chiefly from the great concentration of the urine. But it may also depend upon the decomposition of the tissues which takes place during febrile disease, when the digestive organs almost cease to perform their functions, and the system lives upon itself. Chronic organic disease of the urinary organs, on the contrary, produces a tendency to the phosphatic deposition. Dr. Prout thinks that inflammation of the liver and the heart is peculiarly apt to be accompanied with uric acid sediment in the urine.

Age appears to have some influence. Thus, the disease has been noticed to be most common in infancy, and at the commencement of the decline of life. In the former case, it has been ascribed to an exclusive diet of milk, at once highly azotized and acescent; in the latter, to a diminution of exercise, without a corresponding reduction in the indulgences of the table.

The disease is also more prevalent in certain districts of country than in others. This may be owing partly to differences in the habits and diet of the population, partly to differences in the character of the climate; damp places, and those much exposed to vicissitudes of weather, being considered most liable to renal affections.

Exposure to cold, and injury to the kidneys from external violence sometimes act as exciting causes of uric acid gravel. They may produce the effect by giving rise to irritation of the urinary organs, and consequently to a scanty and highly charged urine; while cold probably operates additionally by checking cutaneous exhalation, and thus directing to the kidneys acid matter which usually escapes by the skin.

The prognosis in this form of lithiasis is generally favourable. It may almost always be relieved when merely in the form of gravel; though, if the original predisposition has been strong, it may not be possible to prevent occasional returns of the complaint.*

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* *Quantity of uric acid in the urine, and means of estimating it.* Among the most recent contributions on this subject are those by Dr. Arthur H. Hassall, contained in the numbers of the *Lancet* for May 6, 13, and 20, and June 17, 1865 (pp. 471, 501, 528, and 646), in which it is shown, by means of series of experiments conducted apparently with great care, that previous results are not to be relied on, and that the quantity of uric acid hitherto stated as the average passed in 24 hours in health, is almost invariably too low. The smallest amount obtained by Dr. Hassall in health was 12·37 grains, the greatest 40·5 grains in 24 hours, the mean 21 grains. (*Page* 647.) There have been various sources of error in the results, which Dr. Hassall has pointed out, and avoided. The following is a summary of his directions.

If diseased, the urine should be tested for albumen, and this, even though in small amount, should be completely separated. To effect this object, the urine must be filtered when decidedly hot. Should there be any deposit of uric acid or the urates in the urine examined, this should be heated until the deposit is quite dissolved. The quantity of urine operated on should not be less than 5000 grains. It should be fresh, especially if it contain albumen or sugar. It should then be submitted to a slow evaporation, and the process should be completed over a water-bath, so as to be secure against decomposition by heat. If the sp. gr. of the urine was 1016 or more, the evaporation should be carried to one-fourteenth of the bulk; if less, to the eighteenth or twentieth. The concentrated liquid is then to be allowed to cool, and for every 5000 grains of the original urine, 50 minims of hydrochloric acid of sp. gr. 1·11, are to be added. In warm weather, the mixture should be placed for 48 hours in an ice-chest or freezing mixture. It should then be filtered through perfectly pure filtering paper; and the residue, while upon the filter, should be washed with cold distilled water, applied by means of a small wash bottle; 400 grains of water being used for the 5000 of urine. The filtrate and washings should be set aside, to see if any further deposition may take place, though this rarely happens when the evaporation has been sufficient. The filter, with the washed precipitate, having been carefully dried on bibulous paper, and by means of a water-bath heat, should then be weighed; the weight of the paper being of course deducted. The filter should afterwards be incinerated, and the amount of ash deducted; and, as the paper employed does not yield an appreciable quantity of ash, any ashes obtained must have been inorganic ingredients of the urine. (*Note to the sixth edition.*)

Phosphatic Lithiasis.—*Ceramuria* (Willis).—This is much less frequent than the preceding variety of gravel. The salts of which the deposit consists are the double phosphate of magnesia and ammonia, the phosphate of magnesia, and the phosphate of lime, either separate or mingled. Unmixed phosphate of lime is rare; the double salt is less so; and the two together are most frequent. These salts are very insoluble, but in healthy urine are held in solution by an excess of acid. They appear in the sediment sometimes in the form of white, shining, crystalline grains, which are, however, almost always mixed with a much larger quantity of a whitish, grayish, or light yellowish impalpable powder; and the latter is often present alone. The phosphatic deposit is distinguished by its whiteness, its insolubility in solution of potassa, and its ready solubility in dilute muriatic and acetic acids. In the early stages, it is sometimes attended with a yellowish sediment of urate of soda or of ammonia; but this diminishes if the complaint continues, and in the advanced stages almost disappears.

The urine is usually more copious than in health, and of a pale colour when passed. It is sometimes clear at first, at other times turbid, and, in the former case, lets fall a sediment upon cooling, and sometimes also upon being heated to the boiling point, probably on account of the escape of carbonic acid. From this latter property it might be mistaken for albuminous urine; but it may be readily distinguished by the solubility of the coagulum in an excess of nitric acid. Another characteristic is the frequent appearance of an iridescent pellicle of the phosphates on the surface of the urine, when it has been allowed to stand for some time. This pellicle is gradually deposited. Phosphatic urine frequently presents beautifully crystalline forms under microscopic examination. In the beginning, the urine is sometimes feebly acid, but more frequently neutral; in the end, it is always alkaline. Its sp. gr. varies very much, according as more or less of it is evacuated. Willis has found it as low as 1·004 in the morning when the urine was copious, and as high as 1·033 at night when it was comparatively scanty. The urine becomes putrescent, with exhalation of ammonia, more speedily than in uric acid lithiasis, or than in health; and, when it assumes this condition, the phosphatic deposition is greatly increased. It is much less liable to be attended with crystalline deposit within the body than the uric acid urine; and hence true phosphatic gravel is comparatively a rare disease, though the urine often abounds in the salts. It was at one time thought that the magnesian and ammoniaco-magnesian phosphates exclusively were found crystallized, the phosphate of lime being always amorphous in the urinary sediment. Dr. Hassall, however, has shown that this salt often appears in well-marked and characteristic crystalline forms, much more frequently, indeed, in the human urine, than the same salt in an amorphous state. (See *Am. J. Med. Sci.*, April, 1860, p. 511.)

The causes of the phosphatic sediment are such as produce an excess of the salts, or an alkaline state of the urine. The phosphates being held in solution in the urine by an excess of acid, are of course deposited when the acid is neutralized, or an alkali predominates. This is probably much the most frequent source of the phosphatic deposition. It has been observed that a disposition to an over-production of the phosphates is apt to accompany a nervous and irritable condition of system, marked by general debility, paleness of complexion, impaired digestion, and a frequent, irritated, and easily excited pulse.*

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* According to Dr. Neubauer, the average quantity of earthy phosphates evacuated in 24 hours is about 15 grains, and this quantity is not increased by the use of the salts of lime. (*Chem. Gaz.*, June, 1856, p. 205.)

Dr. Bence Jones states, as the result of an observation of 100 cases of disease, and of many hundred quantitative analyses, that acute affections of the nervous substance, either organic or functional, are the only diseases in which an excess of the phosphatic salts, The dyspeptic symptoms are sometimes very prominent, with irregular bowels, and deranged hepatic secretion. There is often uneasiness, seldom amounting to pain, in the lumbar region. This condition is found among the poor, as a consequence of unwholesome food, exposure to cold and privation, and wretchedness of all kinds. It occurs also in those whose systems have been worn out by profligate habits, or by over-exertion, whether bodily or mental. In its worst forms, there is often loss of appetite, a listless state both of mind and body, peevishness or acerbity of temper, general debility, emaciation, and a sunken, haggard appearance of the face. It is often associated with chronic organic affections of the urinary organs, uterus, rectum, or spinal marrow.

Injuries of the kidneys, bladder, &c., from local violence, occasionally precede the development of the phosphatic lithiasis. Whatever induces chronic inflammation of the urinary organs disposes to the affection. The diseased mucus which results has been thought to act as a ferment, and thus to induce putrefaction in the urine while still in the bladder. Dr. G. Owen Rees, however, believes that the alkalinity of the urine, in cases of inflammation of the mucous membrane of the kidneys and urinary passages, is owing to the alkalinity of the mucus itself, and not to any decomposing effect it may exert on the urea. (*Lond. Med. Gaz.*, July, 1851, p. 88.) The alkaline condition thus produced strongly favours the deposition of the phosphates, which often form an abundant sediment under these circumstances.

Occasionally, grief or other depressing emotion, exhausting mental application, or debilitating excesses, induce an attack, which subsides upon the removal of the cause. But too frequently the prognosis is unfavourable, in consequence of the organic mischief which lies at the foundation of the urinary disorder. The worst cases are said to be those in which the phosphate of lime alone is deposited, as this is apt to be associated with organic disease of the bladder.*

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earthy and alkaline, can be proved to exist in the urine. Connecting this fact with the discovery of Mulder, that in inflammation the fibrin of the blood is oxidized, he thinks it probable that, when the nervous substance of the brain is inflamed or irritated, its phosphorus is converted into phosphoric acid by oxidation, and thus gives rise to the excess of phosphates alluded to. (*Lancet*, July 29, 1847.) Among other facts, confirmatory of this view, is the one stated by Dr. A. J. Sutherland, of London, that the proportion of the phosphates was found, in a number of cases of insanity examined by him, to be increased in acute mania, and decreased in the exhaustion following a paroxysm of this affection, and in dementia; so that whatever increases the consumption of nervous matter augments the phosphates, and *vice versa*. (*Medico-chirurg. Trans.*, xxxviii. 279.) Dr. G. Owen Rees believes that the phosphatic deposition is, in many cases, attributable to an alkaline condition of the urine resulting from a dyspeptic state of the stomach, in which the acids usually thrown off by the kidneys are secreted with the gastric juice. He admits, however, that disease of the spinal marrow occasions alkaline urine, and consequently phosphatic deposition, from defective innervation; but in these cases he is disposed to ascribe the result to a secondary inflammation of the mucous membrane of the urinary organs, which is well known to cause alkalinity of the urine. (*Lond. Med. Gaz.*, July, 1851, p. 81, &c.)

In considering the pathology of the phosphates, it is worthy of remark that they are quite wanting in the urine of herbivorous animals. (Harley, *Med. T. and Gaz.*, Jan. 1864, p. 4.) It may be inferred that in man, a diet consisting of animal food in excess would probably favour their abnormal production.

* Dr. Rees explains this fact in the following manner. A slight inflammation of the urinary mucous membrane occasions a slight alkalinity of the urine, and a precipitation of the ammoniaco-magnesian phosphate, the presence of which consequently indicates a feeble alkalinity and feeble inflammation. But in the cases in which the mucous membrane is more deeply affected, there is a greater quantity of fixed alkali produced, which, after decomposing all the ammoniacal salts, remains in excess in the urine, and now precipitates the phosphate of lime. The ammoniacal alkalinity of the urine can be readily distinguished by the circumstance, that litmus paper, rendered blue by it after being reddened by an acid, resumes its red colour on becoming dry in the air, in consequence of the escape of the ammonia. This is not the case when the alkalinity is owing to an excess of one of the fixed alkalies. (*Lond. Med. Gaz.*, July, 1851, p. 88.)

Much advantage, however, may be expected from treatment in cases which do not depend upon incurable structural lesions.

Oxalic Lithiasis.—*Oxaluria.*—In this affection the urine is in general tolerably clear, or exhibits only a slight sediment on cooling. In some instances, deposits of oxalate of lime are said to have been noticed, bearing some resemblance to the phosphates in appearance; but they are rare. Upon the whole, it is the absence of sediment, in connection with internal symptoms of calculus, or certain constitutional symptoms, that excites suspicion of the existence of this affection. The suspicion is confirmed, when crystalline or amorphous concretions, found in the urine, prove upon trial to be insoluble in acetic acid, or solution of potassa, soluble in dilute nitric acid, and very slightly so in dilute muriatic acid. Effervescence with dilute acids, after calcination, but not previously, is another character by which the oxalic deposit may be detected.

Oxalate of lime in the urine may be recognized by the transparent octohedral crystals which it exhibits when examined under the microscope. Sometimes also the crystals have the form of a dumb-bell, and sometimes are circular or oval. The dumb-bell crystals, according to Dr. J. W. Griffith, consist of minute needles, aggregated, and radiating from a common centre. (*Lond. Med. Gaz.*, Dec. 1850, p. 1088.) The dumb-bell form of crystals, at one time considered as characteristic of oxalate of lime, has been found in so many different ingredients of the urine, as to have very much lost its value in diagnosis. Dr. Golding Bird first called attention to the fact, that minute crystals of that salt often float in the urine, which ordinarily escape notice on account of their transparency, and close approach in specific gravity to that of the liquid. By gently heating the liquid, and thus diminishing its specific gravity, the crystals are deposited. They also slowly subside, if the urine is allowed to stand; but their absence should not be inferred from their not being observed in the sediment, until at least twenty-four hours after micturition. If any substance capable of acting as a nucleus is present, the crystals are apt to cluster around it; and they generally fall in connection with any other matter which may be deposited from the urine, as, for example, uric acid, or the phosphate of magnesia and ammonia. According to Dr. Bird, there is generally an excess of urea in the oxalic acid urine. Sometimes urate of ammonia and oxalate of lime coexist in the urine. In this case, the opacity of the urate may conceal the crystals of the oxalate, which may thus escape notice. In order, therefore, not to be misled as to the quantity of the latter, it is advisable to dissolve out the urate by a little alkaline solution before submitting the liquid to examination. (*Med. Times and Gaz.*, Dec. 1855, p. 595.)

Little is known of the cause of oxalic lithiasis. The system is not obviously much deranged before the attack. Dr. Prout believes that the predisposition consists in a peculiar morbid condition, which is at first of a somewhat inflammatory character, but afterwards evinces itself by general debility, nervous irritability, dyspepsia, and a tendency to carbunculous affections, and scaly or impetiginous eruptions. According to Dr. Bird, individuals in whom the oxalic urine exists are apt to be irritable and extremely sensitive, dyspeptic, feeble, emaciated, and full of hypochondriacal notions and gloomy apprehensions; and I have myself often noticed that, in patients affected with mental depression in various forms, without any discoverable cause, and with a healthy state of the biliary functions, the urine, on examination, was discovered to abound in the crystals of oxalate of lime. Dr. H. A. Johnson states that, in a number of instances in which he had found this salt in the urine, the patient was subject to severe attacks of neuralgia. (*Bost. Med. and Surg. Journ.*, xlix. 184, from *North-Western Med. and Surg. Journ.*) Contrary to what has generally been thought in relation to the prevalence of oxalic acid lithiasis, Dr. Bird expresses his belief that, in London, the cases in which oxalate of lime exists in the urine, are far more frequent than those in which there is deposition of the earthy phosphates. The immediate cause of production is probably some defect in the assimilative processes; and, in almost all instances, a close investigation will reveal serious functional derangement of the digestive organs.* Dr. Walshe has shown that it is increased in the urine in the convalescence from acute diseases, in anæmia, and in many chronic diseases in which nutrition is impaired. (Budd on *Dis. of Stom.*, Am. ed., p. 204.) Some relation appears to exist between the state of system predisposing to this deposition and that which occasions the deposition of the urates; for it has frequently been observed that the disappearance of one is apt to be followed by the appearance of the other.

It is highly probable that the use of sorrel, and of the footstalks of rhubarb leaves, as articles of diet, favours the production of the oxalic deposit; as both of these vegetables contain oxalic acid combined in excess with potassa. It is probable also that, when a predisposition exists, the free use of sugar may tend to give it effect. The complaint sometimes occurs in infancy; is most common between the ages of fifteen and fifty; and is rare in old age.†

M. Gallois, in a communication to the French Academy of Sciences, maintains that oxalic acid is the result, in the system, of a higher oxidation than uric acid; that the oxalate of lime and uric acid are therefore frequently associated in the urine; that the oxalate is found transiently in the urine in health, especially under the influence of certain aliments; and that, though frequently found in the urine in disease, it is not indicative of the existence of any special affection to which the name of oxaluria should be attached. Complaints in which it is often found are, he says, spermatorrhœa, and certain nervous affections attendant on dyspepsia. (*N. Am. Medico-chir. Rev.*, July, 1859, p. 728.)

Silicious lithiasis is an apocryphal affection. It is true that sand and silicious concretions are asserted to have been discharged from the bladder; but, when the cases are accurately investigated, they invariably prove to be deceptive. The patients are generally females; and the effort at imposition is probably the result, in most instances, of that singular variety of insanity which is occasionally associated with hysteria, and is especially directed towards the urinary or genital organs. In many cases, the substances asserted to have been discharged with the urine have been obviously of external origin, such as conmon sand and pieces of pebbles, glass, or quartz. I once received from a physician in the country a small box full of hard bodies, which he had extracted from the urethra or vagina of a female. One of these was a true calculus, and had been the first extracted. The others were fragments of glass, pebbles, quartz, &c., and had been clearly introduced by the female herself. It is necessary that the practitioner should be on his guard against this species of deception.

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* The fact that uric acid is converted, by the agency of oxide of lead, into urea, oxalic acid, and allantoin, has led to the supposition, that the acid might undergo a similar metamorphosis in the system. To ascertain this point, Wöhler and Frerichs performed some experiments upon animals, the result of which was, that, when one of the urates is introduced into the system, either oxalate of lime, or an abnormal amount of urea, or both, are found in the urine. Urate of ammonia, given to a man in the evening, was followed in the morning by a sediment in the urine consisting chiefly of oxalate of lime, while the urine itself was of high specific gravity, indicating the probable presence of urea in large proportion. This fact may possibly be found of some use in the explanation of the morbid assimilation which characterizes oxaluria. (See *Chemical Gazette*, June 15, 1848, p. 231.)

† In an interesting paper by Dr. Charles Frick, of Baltimore, contained in the *American Journal of Medical Sciences* (N. S. xvi. 281), the views of Dr. Bird are confirmed by the detail of several cases. Dr. Frick has been led to the conclusion, that the oxalic acid deposit is among the most common of those requiring medical interference. In two cases the patients complained that they had never eaten tomatoes without suffering an aggravation of their symptoms; and, as this fruit contains a large proportion of oxalic acid, the inference is obvious, that the use of it as a vegetable may contribute to the production of this variety of urinary disorder. (*Note to the second edition.*)

Dr. H. Bence Jones has so often found oxalate of lime in the urine of persons in good health, that he does not consider it as indicating the existence of any serious disease, scarcely more so, indeed, than urate of ammonia. (*London Lancet*, Feb. 23, 1850.) Professor Lehmann has also frequently found oxalate of lime present in normal urine; and it may now be considered as pretty well established that the presence of this salt in the urine, unless in considerable quantity, or attended with other signs of deranged health, is of very little significance. (*Note to the fourth edition.*)

Effects of Morbid Urinary Deposits.—These differ according to the character of the deposit, and the portion of the urinary organs upon which it acts. It has been before stated that, in the form of impalpable powder, the sediment produces no material effect in its passage. In the form of sand, it often excites very considerable irritation throughout the urinary passages, from the pelvis of the kidney, where it is deposited, to the termination of the urethra. In that of calculus, it gives rise to peculiar phenomena in the several positions which it may occupy, as the kidneys, the ureter, and the bladder. I shall treat of these two forms distinctly.

The commencement of an attack of gravel, in which the sediment is in the form of sand so fine that no mechanical impediment is offered to its passage, is frequently marked with febrile symptoms, either as a part of that condition of system which leads to the deposition, or as a consequence of the irritation of the kidney produced by the deposited matter. There is an excited pulse, furred tongue, headache or vertigo, heat of skin, heaviness, and general discomfort, with not unfrequently more or less pain in the back, which is, however, dull and aching rather than acute. After these symptoms have continued for a day or two, a discharge of sandy matter takes place with the urine, preceded by scalding or cutting pains in the course of the ureter, and at the neck of the bladder, and attended by itching or painful sensations at the outlet of the urethra, with frequent and urgent desire to make water, and a good deal of straining in the effort. These sensations are much modified in different cases, in some rising to the most violent strangury, in others scarcely exceeding a moderate burning with a little uneasiness along the passages. After a short time, the symptoms become milder or cease for a while, to return in renewed paroxysms, until at length the morbid tendency seems to give way, and the patient is restored to health; or the affection assumes a chronic form, and runs on for a long time, perhaps indefinitely, with irregular alternations of remission and exacerbation. Not unfrequently it appears at first with milder features, and becomes aggravated as it advances. In the great majority of cases, the discharge is of the uric acid character, especially when attended in the commencement with febrile symptoms, and always when associated with gout. In the phosphatic variety, the sufferings from the mere deposition are so mixed up with those incident to the organic disease in the urinary organs, that it is not always easy to determine how much is to be considered as the effect of the proper lithiasis. One of the painful paroxysms or exacerbations, attendant upon the evacuation of sandy matter, is usually called a fit of the gravel.

When concretions form so large as to come under the designation of calculi, the effects are much more serious. They are different, according as the calculus is in the kidney, ureter, or bladder.

Calculi are almost always formed originally in the kidney. Crystalline particles are often observed in the tubuli uriniferi, and small concretions are occasionally seen sticking in the points of the papillæ, and partly projecting into the infundibula. Not unfrequently they are detained in the pelvis or calyces, sometimes singly, but occasionally also in considerable numbers. They are of various sizes, generally small, often not larger than the head of a pin, and seldom larger than a pea. Occasionally, however, they attain a great magnitude, filling the pelvis and calyces of the kidney, and weighing two or three ounces. In many instances. they produce little obvious effect, and are carried for a long time without serious inconvenience. There may be occasional uneasiness in the lumbar region, and embarrassment in the passage of the urine, with the discharge of calculous matter; but the symptoms are not such as would lead to the suspicion of the existence of renal calculi. Often, however, it is otherwise. There is much pain in the region of the kidney, with all the other symptoms of nephritic inflammation, such as frequent micturition, scanty, high-coloured, or bloody urine, nausea and vomiting, and sometimes pains shooting towards the groin or down the thigh, with retraction of the testicle, &c. (See *Nephritis.*) Much importance is attached to hæmaturia in greater or less degree, as characteristic of a calculus in the kidney; and it is no doubt a valuable symptom; but blood is sometimes absent, at least in observable quantity; and the practitioner, therefore, should be on his guard against inferring the non-existence of the disease from the want of it. (*Dr. G. Owen Rees.*) Sudden jars or concussions of the body from a false step, jumping, rough riding, &c. are apt to excite uneasiness and even acute pain; and rest is attended with greater relief than in inflammation of the kidneys from other causes. The occasional discharge, moreover, of calculous matter by urine serves to direct attention to the nature of the case; and the particular character of the renal calculus may often be told from the nature of the substance discharged. The symptoms, though somewhat relieved by treatment, are apt to return in consequence of the continued presence of the irritating matter, until at length, after an attack of nephritic colic, such as attends the passage of a calculus through the ureter, one or more small concretions escape with the urine, and the complaint often ceases for a time, or disappears altogether. The continued presence of calculi in the kidney sometimes leads to very serious organic disease, such as abscess, absorption of the glandular structure, and great distension consequent upon obstruction to the flow of urine. (See *Chronic Nephritis*, and *Organic Diseases of the Kidneys.*) Sometimes also it gives rise to fatal suppression of urine, probably by compression of the secreting vessels, either directly, or through the intervention of the accumulated and retained secretion.

When the calculus enters the ureter it produces a double injury; first, by its rough surface or sharp angles, wounding the mucous membrane, and, secondly, by its magnitude distending the coats of the tubes, and thus inducing excessive irritation. The pain which attends its passage is sometimes excruciating, and perhaps equals any to which the human frame is liable. It is usually more or less paroxysmal, and has therefore been called *nephritic colic*. The affection has been already sufficiently described under the title of *nephralgia*, to which the reader is referred. After a variable duration of the severest suffering, the patient is often suddenly relieved by the escape of the calculus into the bladder, and it is said that the relief is sometimes preceded by a paroxysm of unusual intensity, in consequence of the greater sensibility of the extremity of the duct. In some instances, the calculus is detained in the ureter, either producing complete obstruction, and consequent accumulation of urine, with distension, ulceration, or rupture, or so arranging itself in the end as to allow the urine to flow past it, and thus producing directly no other mischief than inflammation in its immediate neighbourhood. In relation to the effects caused by the different kinds of calculi in the ureter, it is probable that the oxalate of lime concretions produce the severest pain from their roughness and hardness, and the phosphatic the least because less generally crystallized. The latter, however, are comparatively rare; as the phosphates are little disposed to form original concretions, and are generally produced by deposition about a nucleus. The uric acid concretions are greatly more numerous than both the others conjointly. The character of the calculus may be conjectured from that of the urine. If uric acid or the urates are copiously deposited, the concretions may be supposed to be of the same nature; and so also of the phosphates; while the absence of all deposit, or the presence of an oxalate in the urine, especially if the nephralgic paroxysms are unusually severe, would lead to the suspicion that the offending cause might be the oxalate of lime.

In the *bladder*, a small calculus does not necessarily occasion much uneasiness. The immediate relief experienced upon its escape from the ureter is so great, that the patient is scarcely sufficiently upon his guard against the ultimate consequences. Generally, the calculus passes rapidly through the urethra; as this tube is of larger caliber than the ureters. In some instances it sticks in its passage, causing painful pricking sensations, and a more or less complete obstruction of the urine. This is a case exclusively for the surgeon. Not unfrequently, however, from want of due attention at the time, it remains in the bladder, and becomes the nucleus of a stone. It is probable that calculi seldom originate in the bladder. A nucleus, generally of uric acid, sometimes of the oxalate of lime, and sometimes, though rarely, of other matters, enters through one of the ureters, and then receives accretions, either of its own or a different nature, according to the state of the urine. Should the phosphatic condition prevail, in consequence either of the general state of the constitution, or the alkalinity of the urine from local causes, the additions will consist of the phosphates. Not unfrequently, alternate layers of different deposits are found in the stone. Occasionally, instead of a nucleus of uric acid, or the oxalate of lime, the deposition will take place around a portion of coagulated blood or fibrin, or any foreign body that may have accidentally entered the bladder. Sometimes the calculus remains long in the bladder, and increases greatly before it produces much inconvenience. Generally, however, its presence is indicated by a disposition to frequent micturition, an occasional sudden stoppage of the stream of urine, painful spasmodic contractions of the bladder, the discharge of blood from the urethra, and itching and painful sensations in the glans penis, which lead, especially in children, to a frequent pulling and great elongation of the prepuce. These symptoms are gradually increased. The disposition to pass water becomes at length extremely urgent and almost incessant, and the spasms of the bladder exquisitely painful. The least jar occasions severe suffering, so that riding in a rough vehicle becomes almost impossible. Vesical mucus is discharged in great quantities, the urine becomes offensive, and copious deposition of the phosphates often takes place. The general health at length gives way. Hectic fever ensues, with great debility and emaciation; and at last death from inflammation and disorganization of the bladder relieves the patient. These symptoms, however, though strongly characteristic, should not be exclusively relied on in forming a diagnosis. Sounding is the only infallible method of determining the existence of stone in the bladder. Sometimes the stone is encysted; and then the symptoms are much more obscure. To the physician it is chiefly important to know that calculus in the bladder exists, in order not to confound it with other complaints; and to be aware of its composition, in order that he may administer suitable palliative remedies. The latter knowledge is to be obtained exclusively by the examination of the urine, and the matters discharged with it.

Treatment of Lithiasis.—The means of relieving the effects produced upon the kidneys, ureters, and bladder by calculous depositions, are treated of elsewhere. (See the articles *Nephritis*, *Nephralgia*, and *Cystitis.*) The measures which require attention here, are those calculated to prevent the deposition from taking place within the body, and to remove the deposited matter. As the mode of treatment is influenced by the character of the calculous matter, it will be proper to give separately the treatment adapted to the three prominent forms of lithiasis already described.

1. In the *uric acid* variety, the indications are 1. to render the uric acid more soluble in the urine; 2. to increase the solvent power of the urine itself; 3. to correct the constitutional tendency to excess in the production of uric acid, or of any other acid which may have the property of precipitating it from its solution; and 4. to remove from the body any calculus which may have been already formed.

To render the uric acid more soluble, recourse must be had to the alkalies or alkaline earths. These are, indeed, by far the most efficient remedies in this variety of lithiasis. The bicarbonate of soda or of potassa should be preferred, as less liable than the caustic alkalies, or even their carbonates, to injure the stomach. Either of these bicarbonates may be given for a long time without injury. I have always employed bicarbonate of soda, and seldom found it to fail in correcting, for a time, a tendency to the deposition of uric acid or the urates. It is less unpleasant than the corresponding salt of potassa, and probably not less efficacious. By rendering the urine alkaline, these salts enable it to hold the uric acid in solution. They have the additional advantage of increasing the secretion of urine, and thus meeting the second indication. It is obvious that they do not correct the excessive production of the acid; but they afford relief to the symptoms, and prevent injury, while other means are employed for effecting a radical cure. When the cause of the excess of uric acid is temporary, it often happens that no other remedies are necessary. The bicarbonates have still another advantage, that they are capable of dissolving the phosphates as well as uric acid, and consequently do not occasion the deposition of these salts, as the carbonates and caustic alkalies are accused of doing. They should be used freely, and dissolved in a large quantity of liquid. The best solvent for them is carbonic acid water, as it is usually very acceptable to the stomach, and at the same time supplies any deficiency of carbonic acid which may exist in the salt. Half a drachm of bicarbonate of soda may be given, dissolved in from four to eight fluidounces of carbonic acid water, with or without ginger syrup, four times a day. It should be continued until the urine ceases to yield any sediment on cooling, passes freely, and recovers its natural colour; and, if omitted, should be resumed immediately upon the recurrence of the symptoms. The natural mineral waters, most useful in calculous complaints, are those containing bicarbonate of soda. Such are the celebrated waters of Vichy, in France. Solution of potassa, the alkaline carbonates, magnesia, lime-water, and soap have all been employed to meet the same indication, and all to a certain extent with the same effect. There might be circumstances under which one of these antacids would be preferable; as lime-water, for example, in cases of chronic nausea and vomiting; but, as a general rule, they are inferior to the bicarbonates.

Borax and phosphate of soda have been recommended in this variety of gravel, in consequence of their solvent power over uric acid. Benzoic acid was also suggested by Dr. Alexander Ure; but the supposition upon which the suggestion was founded, that this acid has the property of converting the uric into soluble hippuric acid in the system, has not been sustained. Upon another principle, however, as will be seen directly, it proves useful in phosphatic depositions.

To meet the second indication, that, namely, of increasing the solvent power of the urine, means must be employed to increase its quantity. Hence, the patient should drink freely of cool diluent liquids, such as gum arabic water, flaxseed tea, and the infusion of slippery elm, sassafras pith, and benne leaves. Carbonic acid water is sometimes a useful beverage in these cases. Benefit will now and then accrue from adding some diuretic substance to the drink, especially in chronic cases in which moderate stimulation may not be objectionable. Such additions are the oil of juniper, wild-carrot, and the spirit of nitrous ether. It has been stated that the alkaline bicarbonates serve also to fulfil this as well as the first indication.

In order to correct the tendency to an excessive production of uric acid, we must remove its causes. The patient, therefore, should be restricted to a vegetable diet in the acute form of the complaint; and, even in chronic cases, should employ animal food with moderation. Alcoholic drinks should be forbidden. To prevent the generation or accumulation of any other acid in the system, which may tend to precipitate the uric acid, acescent articles of food should be avoided, as well as substances of difficult digestion, which may favour the production of acid in the stomach by diminishing its solvent powers. The alkalies also meet this indication by neutralizing any excess of acid produced. Other means calculated to prevent accumulation of acid in the circulation, are such as excite the skin or the bowels to increased action, and throw off the acid through these emunctories. In the febrile state, the neutral cathartic salts may be used as purgatives, and the citrate of potassa and acetate or citrate of ammonia as diaphoretics. The latter salts are best given in the state of effervescence. They have the additional advantage, that, by the decomposition of their acid ingredients in the process of digestion, they increase the alkalinity of the blood, and impart this property also to the urine. In the absence of fever, combinations of opium with ipecacuanha or tartar emetic will be useful, especially at bedtime. Recourse may also be had to the warm bath. Flannel should be worn next the skin. Moderate exercise is advantageous, both by enabling the system to appropriate the food admitted into it, without the necessity of throwing off the excess in the form of urea or uric acid, and by sustaining the eliminating function of the skin.

The fourth indication is to be fulfilled by means directed to the solution, disintegration, or mechanical expulsion of the calculus. These are to be resorted to whether the calculus is in the kidney or the bladder. To effect its solution, no means are so efficacious as a very free and long-continued use of the alkaline bicarbonates. The urine should be brought into the alkaline state by these salts, and kept so for months if necessary. Instances are recorded, in which there is reason to think that even stones in the bladder have been completely removed in this way. Renal calculi are supposed to have been sometimes disintegrated, and thus rendered capable of expulsion, by the use of stimulating diuretics, such as oil of turpentine, copaiba, and cantharides. It is certain that sometimes, after the free use of these substances, large quantities of calculous matter have been discharged with the urine, to the great relief of previous uneasiness in the lumbar region, and other morbid symptoms. But their mode of action is not so certain. It may be that, by their stimulant influence upon the kidneys, they enable the tubuli uriniferi more thoroughly to discharge the calculous matter, than under the influence of ordinary diuresis. It may be, also, that the calculous matter alluded to is the result of a stimulated secretion, and the relief owing to its elimination from the system.

When there is reason to think that the calculi are fixed in the kidneys, it is possible that the concussion of emetics, united with the relaxing influence of the nausea they produce, may cause their dislodgment; and horseback riding, or the motion of a jolting carriage, has been recommended with the same view; but these measures must be employed with great caution.

Of the measures calculated to facilitate the passage of the calculus into the bladder, sufficient has been said elsewhere. (See *Nephralgia.*) After it has reached the bladder, means should be immediately employed for its expulsion, if it do not pass out spontaneously. This is of the utmost importance; as it is by such precaution that the formation of stone in the bladder is to be prevented. When, therefore, there is reason to believe that a calculus has escaped from the ureter, the patient should be directed to retain his urine as long as he conveniently can, drinking in the mean time freely of water or mucilaginous fluid, and, when the bladder is quite full, to bend his body forward so as to make the entrance to the urethra the lowest part, and then to discharge his urine in a full stream. The urine should be carefully examined to ascertain whether a calculus has passed. If not, the above process should be repeated time after time. Sir B. Brodie recommends that, previously to the discharge of the urine, a large bougie should be introduced into the bladder, and withdrawn at the moment of the effort of micturition. The calculus sometimes follows the bougie immediately. During the employment of these methods, attempts to dissolve, or at least prevent the increase of the calculus should be made by the free use of the alkaline bicarbonates. Should the calculus be lodged in the urethra, surgical aid will be necessary. Should none be discharged, and yet all symptoms of its presence in the bladder cease, it may be supposed to have been dissolved; and, in the course of two or three weeks, the efforts for its solution or expulsion may be omitted.

It has been said that persevering efforts should be made to effect the solution of stone in the bladder by the internal use of the alkaline bicarbonates. Should this object not be obtained, and, when the stone is of any considerable size, success is hardly to be expected, still much good may possibly be done by preventing further deposition, and thus obviating increase of bulk and roughness of the surface. The solution of stone in the bladder by the injection of certain fluid menstrua has been frequently attempted. Sir B. Brodie succeeded, in one instance, by the injection, every two, three, or four days, of water acidulated with nitric acid in the proportion of two and a half minims to the ounce. (*Lond. Med. Gaz.*, viii. 355.) This injection is adapted to the phosphates. In the case of uric acid calculus, a solution of the alkaline bicarbonates should be employed. This apparently very rational mode of treating vesical calculi has not been sufficiently tried. By the use of a double catheter, a constant stream into and out of the bladder may be kept up as long as may be considered desirable. Galvanism has been proposed as a means of effecting the solution or disintegration of the stone; and an instrument has been devised by Mr. Charles Phillips, by which the influence of a galvanic current, and at the same time that of a current of liquid having a chemical action upon the stone, may be brought to bear upon it.

2. In the *phosphatic* variety of lithiasis, the most important indications are 1. to prevent the production of an excess of the phosphates, and 2. to prevent their deposition. The production in excess being associated with dyspepsia, general debility, and nervous disorder, it is important to obviate these several conditions by tonics, attention to the state of the bowels and the hepatic secretion, a proper regulation of diet and exercise, and a judicious use of narcotics. The whole treatment applicable to dyspepsia may be employed. (See *Dyspepsia.*) In relation, however, to exercise, care must be taken, if a calculus already exists within the body, that it be not too violent. Should any evidence exist of over-exertion of the cerebral or spinal functions, or of inflammation of the nervous centres, means should be employed to correct these conditions. Opium is admitted by all to be an invaluable remedy in this variety of lithiasis. It not only quiets the irritation of the urinary organs, and of the nervous system, and thus greatly increases the comfort of the patient; but it controls also the secretion of urine, which it tends to keep in the proper state both as to quantity and quality. Thus, it is asserted that no means are more efficacious in maintaining the healthy acidity of urine than the use of opium. The patient should be kept under its moderate influence during the paroxysms. The dose may be from half a grain to a grain, two, three, or four times a day. When opium disagrees with the patient, some other narcotic, as camphor, hyoscyamus, conium, or dulcamara may be resorted to. Strychnia has been

recommended in reference to its operation on the spinal marrow, derangement of which is supposed to be a fruitful source of alkaline urine, and consequently of the phosphatic deposition.

The deposition of the phosphates would be best prevented by rendering the urine acid. On this account the mineral acids were at one time highly recommended, under the impression that they might be secreted with the urine, and supersaturate the alkali. But it has been ascertained that these acids do not enter the urine in their free state, and it is asserted that they have not been found to correct the alkalinity of this secretion. This is probably true in many cases. When the alkalinity depends upon causes acting in the urinary organs, as upon the secretion of unhealthy mucus, the acids cannot affect it, as they do not reach these organs in their free state. But when it depends upon the state of the blood, or the general condition of the system, they may probably do good by neutralizing alkali which might otherwise find its way into the urine. At any rate they are excellent tonics, and peculiarly adapted to the condition of system characteristic of the phosphatic diathesis. Either the sulphuric, nitric, muriatic, or nitromuriatic acid may be employed. The last would be peculiarly appropriate in cases of disordered hepatic secretion. Some of the vegetable acids appear to have done good occasionally in lithiasis. Thus, cures are asserted to have been frequently produced by the use of hard cider. At least this remedy is worthy of being tried in the phosphatic variety of the disease. Benzoic acid renders urine acidulous, probably by conversion into hippuric acid, and may be given, therefore, in the phosphatic lithiasis with great effect, so far as concerns the prevention of the deposition.*

But it appears to be now generally admitted, contrary to former opinion, that the alkaline bicarbonates are the most efficient medicines in preventing the deposition, and effecting the solution of the phosphatic, as well as of the uric acid sediments. It is only the bicarbonates, however, that have this effect. The carbonates and pure alkalies increase the deposition.

No advantage accrues from an increase of the secretion of urine. It is indeed frequently too copious, and sometimes requires repression. As the disease is often associated with chronic inflammation of the mucous membrane of the kidneys and bladder, and probably owes its obstinacy to this cause, remedies which produce an alterative impression upon these organs are occasionally useful. Hence the turpentines or their volatile oil, copaiba, buchu, uva ursi, pareira brava, &c. may sometimes be advantageously administered. By correcting the secretion of mucus, they obviate the cause of the alkalinity of the urine, and consequently the phosphatic deposition. It is hardly necessary to observe that the patient, in this as in the preceding variety of lithiasis, should be clothed in flannel. He should especially avoid the use of hard water as drink. Both the sulphate and carbonate of lime, often contained in such water, may possibly dispose to the phosphatic sediment. Stone in the bladder is peculiarly abundant in limestone regions.

The remarks made in relation to the treatment of stone in the bladder, in the uric acid variety of the complaint, are also applicable here.

3. In the treatment of the *oxalic lithiasis*, the practitioner must be guided by the general condition of the system. Sometimes it may require a mode-

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* Dr. G. Owen Rees thinks that the indication in this affection is not, as has been supposed, to render the urine acid. He believes that acid urine irritates the mucous membrane, and has the effect of sustaining the inflammation in that membrane, which he considers to be the most frequent cause of alkalinity of the urine, and of the consequent phosphatic deposit. He rather advises the use of alkaline medicines and demulcents, by which, the irritating acid being neutralized, the secretion is rendered blander and the inflammation is allowed to subside, or may yield to other treatment. He advises especially the alkaline salts, as the citrate and tartrate of potassa, which have a powerful influence in rendering the urine alkaline in consequence of the decomposition of their organic acid. (*Lond. Med. Gaz.*, July, 1851, p. 85.)—*Note to the third edition.*

rate antiphlogistic treatment, sometimes the reverse. Dr. Prout recommends mineral acids, particularly the nitric, combined with other tonics, in order to change the diathesis to that in which the disposition is to deposit uric acid. But as soon as any tendency to the latter sediment is observed in the urine, the treatment should be suspended. Of the acids, Dr. Bird prefers the nitromuriatic, but, when great nervous irritability exists, recommends sulphate of zinc, and, in anemic cases, the chalybeates. He has found advantage from colchicum in some obstinate cases. The shower bath also is useful. Nitromuriatic acid has proved very efficacious in my experience. M. Gallois has found the alkaline mineral waters most effectual, especially when the oxalate is attended with uric acid. All articles of diet containing oxalic acid, or readily converted into it, should be forbidden. The patient should, therefore, avoid sorrel, whether of the genus oxalis or rumex, as a salad, should never eat rhubarb pies, and should partake very moderately of sugar. Indigestible substances generally should be excluded from the diet, and no fermented liquor allowed. Dr. Bird considers a very small quantity of brandy and water at meals as the best beverage. Flannel should be worn next the skin. The dietetic and general hygienic rules adapted to dyspepsia are applicable to this form of lithiasis. Little or nothing can be done to dissolve the oxalate of lime when deposited. So far as regards mechanical measures for expulsion, the same rules are applicable as to the uric acid calculi.

Article XI.

RETENTION OF URINE.

When urine is secreted, but not evacuated, it is said to be retained, and the affection is denominated retention of urine. This may occur in the kidneys, or in the bladder. In either position, the water of the urine is partially absorbed, and, according to Kaupp, a portion of its solid ingredients also, especially the salts, but of course less rapidly than they are secreted; so that accumulation takes place. (Harley, *Med. T. and Gaz.*, Jan. 1864, p. 119.)*

1. Renal Retention.—This is not always easily distinguishable from suppression of urine, in which the secretory function is suspended or abolished. In both, the discharge of urine either greatly diminishes, or entirely ceases; and in both, the signs which indicate fulness or distension of the bladder are wanting, and little or no urine escapes upon the introduction of the catheter. In retention, however, there is much more pain than in suppression. There is, also, in the former, a distressing sense of weight or distension in the lumbar region; great uneasiness is produced by strong pressure in the loins; and it is asserted that the ureters and kidneys have sometimes been so much distended as to form a fluctuating tumour, discoverable from without. Besides, the retention is seldom complete. Occasionally there may be a considerable discharge of urine, consequent upon a partial removal of the obstruction; and, even if no urine pass the obstructed point, still a portion will enter the bladder from the opposite kidney, if undiseased. In suppression, there is either no discharge, or the quantity is very small, and liable to little diversity.

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* *Ammonæmia.* Another consequence of retention is a change in the urea, which becomes decomposed, with the evolution of carbonate of ammonia; and this is supposed to act injuriously, not only by irritating the mucous membrane, but also by absorption into the circulation, where it gives rise to a disordered state of the blood, designated by some writers as *ammonæmia*, characterized by an ammoniacal smell of the breath and perspiration, a dry tongue, a sallow complexion, general emaciation, intermittent rigors, and, if not relieved, death, preceded for some days by coma. (*Jacksch.*) It is not, however, easy to determine how much of the effects here detailed may proceed from ammonia, and how much from other causes. I must confess that it has never fallen to my lot to witness a fatal case of disease, in which death appeared to me ascribable to the absorption of ammonia. Indeed, though I have seen carbonate of ammonia largely exhibited with a view to its stimulant effects, more largely, I think, than it could ever have been absorbed from the urine, I never witnessed from it, to the best of my knowledge, any symptoms which could be considered alarming. (*Note to the sixth edition.*)

The consequences of renal retention, unless the obstruction be speedily removed, are very serious. If the obstruction exists in the upper part of the ureter, the pelvis of the kidney, and even the kidney itself become greatly distended; and the renal structure has sometimes been so much stretched out as to form a sort of membranous bag. When the lower part of the ureter is closed, this tube becomes also vastly dilated above the point of obstruction. In some instances, there is reason to believe that suppression is induced in consequence of pressure upon the secreting surfaces, and death speedily results from this cause. In other cases, inflammation, suppuration, and complete disorganization of the kidney take place, with rupture, and all the fatal consequences of effused pus and urine.

The most frequent causes of renal retention are calculi in the ureter, or at its origin in the pelvis of the kidney. Coagula of blood or fibrin may produce the same effect. Obstruction of the passage may also arise from inflammatory thickening of the coats of the ureter, or the pressure upon it of tumours from without.

2. Vesical Retention.—Retention of urine in the bladder is, in general, very easily distinguished. The occurrence of inability to make water leads to an examination of the bladder, which is felt above the pubes, forming a roundish, well-defined, and sometimes visible tumour. Occasionally, however, in very fat persons, or in tympanitic states of the abdomen, it cannot be easily distinguished by the touch. In this case, the dulness upon percussion over the whole region which it occupies, contrasting with the resonance of the surrounding space, will be sufficiently diagnostic. A complication of ascites with retention might cause some embarrassment; but the peculiar pain produced by pressure on the distended bladder, or, if this fail, the introduction of a finger into the rectum, or of a catheter through the urethra, will soon decide the question. The distension goes on increasing with the continuance of the retention; and the bladder sometimes acquires enormous dimensions, reaching to the umbilicus, or even, in some rare instances, as high as the scrobiculus cordis. It has, under these circumstances, been mistaken for ascites, and, in woman, when attended with severe pain, for the state of labour.

There are two conditions of retention materially differing in their symptoms; one, in which the affection is suddenly induced, the other, in which it comes on gradually. In the former, there is usually much pain in the hypogastrium and perineum, with a constant and distressing desire to pass water, but ineffectual notwithstanding the strongest efforts. The pain is much increased by pressure over the pubes. If the affection continues, the patient becomes feverish, restless, anxious, and exceedingly distressed, until at length a portion of the bladder or urethra gives way, and the urine escapes either into the peritoneum with inevitably fatal results, or, more frequently, into the neighbouring areolar tissue, producing inflammation, sloughing, and generally death. When the retention is partial, and the accumulation in the bladder gradual, this viscus accommodates itself to the pressure, and may be greatly distended without much uneasiness. The ureters, and even the pelvis of the kidneys, sometimes participate in the distension. Sooner or later, however, unless relieved, the same symptoms are apt to come on as in the acute form, and with the same fatal result.

The causes of vesical retention are twofold, namely, obstruction of the urethra, and a loss or diminution of the contractile power of the bladder. Obstruction may arise from inflammatory swelling of the mucous membrane and areolar tissue at the entrance of the urethra; and, in this case, the symptoms of irritable or inflamed bladder are added to those properly belonging to the retention. It may also arise from spasmodic contraction of the sphincter fibres under the influence of cold, direct irritation, inflammation, or nervous disorder, especially hysteria. Other causes of obstruction are a pendulous tumour falling upon the entrance of the urethra, tumours of the uterus or vagina, the gravid uterus pressing on the neck of the bladder, and more frequently still, especially in old people, enlargement of the prostate. But the most frequent obstruction of all, is that from stricture of the urethra. Diminished contractility of the muscular coat may arise from the debility of old age, the deficient innervation of low fevers, and cerebral or spinal disease, attended with paralysis. In these cases, the retention is not complete. When the bladder is to a certain degree distended, even though it may have lost all muscular power, its elasticity is sufficient to overcome the feeble resistance of the sphincter, and a portion of the urine escapes, in general, involuntarily. This happens especially at night; and there is some danger of mistaking the affection for incontinence, unless the practitioner is on his guard. In states of system in which the patient is insensible, as in typhoid fevers, there is peculiar liability to this mistake, which may lead to serious consequences. This state of the bladder is often very annoying. All voluntary power of evacuation is lost, but with every movement which causes gravity to favour the discharge of the urine, and with every unusual degree of pressure on the bladder, as in coughing or sneezing, a portion of the urine escapes involuntarily, producing irritation, and even excoriation of the skin where in contact with it, and an excessively disagreeable odour about the person. Such cases are a combination of retention and incontinence. The very act of distension has the effect of debilitating the muscular coat, and, in the end, if continued, of entirely destroying its contractile power. Hence, the habit of resisting the desire to evacuate the urine may, if long enough continued, gradually induce retention.

Treatment.—Renal retention, if consequent upon inflammation, must be treated by means adapted to the cure of nephritis; if upon calculi or coagula in the ureter, by those which are recommended under lithiasis and nephralgia. In vesical retention, when proceeding from inflammation at the neck of the bladder, bleeding, leeching, saline cathartics, antimonials, emollient cataplasms, and the warm bath are suitable remedies, and will seldom fail. To attempt to relieve the complaint with the catheter would in general only aggravate the irritation. The instrument should be resorted to in this and the following case, only when rendered absolutely necessary in order to relieve very painful or dangerous distension. When spasm is the cause of retention, an anodyne enema will often be found an effectual remedy; and the inhalation of ether or chloroform will probably answer the same purpose, the former of the two being preferable as the safer. Tobacco or lobelia cataplasms to the perineum may also prove useful. In these cases, too, the tincture of chloride of iron, and the alcoholic solution of ammoniated iron have been recommended. Should the spasm be hysterical, or the retention depend upon hysteria in any other way, the remedies applicable to this disease must be employed, and especially cups or leeches, with subsequent blistering, or pustulation over the spine. But care should be taken, in such cases, not hastily to resort to the catheter; for, if once used, it is again and again called for, and becomes at length a necessary source of relief. When the obstruction is purely mechanical, as from stricture of the urethra, enlarged prostate, &c., the catheter becomes indispensable; and, if this cannot be introduced, the bladder must be punctured. Such cases, however, belong to the surgeon.

Retention arising from deficient power in the muscular coat must be treated according to the circumstances in which this loss of power originated. If the seat of disease is in the spine, cups, blisters, antimonial pustulation, and setons or issues to the back are appropriate remedies; and some have recommended moxa and even the actual cautery. If the paralysis of the bladder is only a part of a general affection, dependent on disease of the brain, it must be treated accordingly. If quite local, or connected with general debility, it is to be encountered by tonic treatment addressed to the system, and stimulants to the bladder itself. The cold bath, and the cold douche to the perineum and pubes, are sometimes useful by rousing a salutary reaction. Electricity has also been employed to stimulate the bladder, one pole of an inductive apparatus being introduced into that organ, the other into the rectum. Strychnia or nux vomica, quinia, tincture of chloride of iron, uva ursi, pareira brava, buchu, cubebs, oil of turpentine, benzoic acid in the dose of ten grains three times a day, and cantharides have all been recommended, and may be tried successively, or variously combined. Aloetic laxatives should be preferred in order to keep the bowels regular, unless the patient be troubled with piles. Ergot has been used by M. Passot, of Lyons, under the impression that it acts upon the bladder in the same manner as on the uterus; and he reports a number of cases in which it is said to have proved effectual. (See *Am. Journ. of Med. Sci.*, N. S., xxvi. 488.) Repeated blistering to the sacrum will occasionally prove useful, and electricity or galvanism may be tried with the hope of benefit. In these cases, the use of the catheter is important in order to prevent distension of the bladder, which has the effect of increasing its debility. It should be introduced at least twice a day, and, if more frequently, so much the better. M. Foucher has recently strongly recommended, in atony of the bladder, the injection of various liquids into that cavity in the pulverized state, by means of one of the instruments lately introduced into use, under the name of atomizer or pulverizer. A simple catheter with a capillary point may be introduced, when the object, as in simple atony, is to direct a fine jet upon the walls of the bladder; but in cases attended with catarrh of the bladder, a double catheter is preferable, by which a shower of the pulverized fluid may be made to fall on the whole interior surface. The liquids used may be pure water, or, when a special impression is desired, tar water, infusion of buchu, &c. No other sensation is produced than a decided feeling of cold behind and over the pubes. (*Med. T. and Gaz.*, Jan. 1865, p. 16.) After recovery, the patient should be scrupulously careful to obey the call to pass water in due time, lest accumulation should take place and produce distension.

Article XII.

INCONTINENCE OF URINE.

Syn.—*Enuresis.*

In this affection there is a want of power to control the discharge of urine, which is evacuated involuntarily. There are two very different conditions of the urinary organs, both of which are attended with incontinence. In one, the bladder is so highly irritated that the sphincter, though in a healthy state, cannot resist the urgent desire of micturition; in the other, the sphincter is debilitated or palsied, and cannot contract sufficiently to retain the urine, in the ordinary state of the bladder. In the former, the bladder may be inflamed or highly irritated, so as to be unable to tolerate the presence of healthy urine; or the urine may be morbidly acrid, so as unduly to excite the bladder, though this may have been previously in a normal condition. This sort of incontinence also frequently accompanies stone in the bladder.

But it is the second condition which constitutes true incontinence. In this, the sphincter either relaxes under less than the ordinary stimulation from the urine, or is quite destitute of the power of contraction, so that no other impediment exists to the escape of urine than the pressure of the soft parts upon the channel of the urethra; a resistance which the slightest force is sufficient to overcome.

Not unfrequently both these conditions exist in the same case; the bladder being irritated to more than its ordinary contraction, while the sphincter has less than the ordinary power of resistance.

Under the influence of sudden emotion, especially of fear, involuntary discharges of urine sometimes take place. These can be considered as morbid only when they occur habitually, or from comparatively slight causes.

The most frequent form of incontinence is that in which the sphincter retains considerable contractile power, but yields habitually to slight impulses when the will is not sufficiently on its guard, or when it is to a considerable degree inoperative, as in sleep. Involuntary discharge of urine at night is a frequent and very disagreeable affection. It is most common in children before puberty, and is apt to cease spontaneously after this period, but is sometimes prolonged into adult age. Though in itself of little importance in reference to the health, it often becomes highly important in its moral influences, sometimes affecting the character and whole future life of the patient. The discharge during sleep frequently occurs in consequence of dreams; but often also it is altogether involuntary, without the least consciousness on the part of the patient, and dependent solely upon the relaxation of the sphincter under the stimulus of the urine. It is said that the position of the patient has some effect, and that he is more apt to make water when lying on the back than upon the face or side. I have, however, some doubts of the accuracy of this statement. Occasionally, the incontinence is experienced also during the day, so that the patient cannot retain his urine so long as persons in ordinary health. This affection is often attended with an acrid condition of the urine, which is high-coloured, and loaded with uric acid in solution, or even with sediments of the acid or its salts. In this case, there is a combination of irritation of bladder with debility of the sphincter. More frequently, however, the urine is pale and watery, and secreted in unusual quantity. The affection appears to be hereditary, or at least occurs frequently in several members of the same family.

A variety of incontinence analogous to the above occasionally arises from irregular nervous action, especially in hysterical cases. There is in these cases less a positive debility of the sphincter, than an irregularity of innervation, which is as often excessive as deficient.

But the most deplorable cases of incontinence are those connected with complete paralysis of the sphincter, or a total loss of power in the muscular fibres thus denominated, in consequence of mechanical injury, as from the operation of lithotomy in females, and from severe labours. The paralysis of the sphincter may not extend to the muscular coat of the bladder generally, in which case the urine will be occasionally discharged in a jet, when from position or other cause it has accumulated considerably; or the bladder may share the same loss of power, and then incontinence may become involved with retention; the bladder being frequently full or distended, while the urine dribbles away whenever the elasticity of the coats is sufficient to overcome the slight resistance of the urethra, or gravity favours the discharge. This condition of things is most common in the old, and is sometimes associated with disease of the prostate. The disease, like retention from a similar cause, may be quite local, or may be associated with paralysis of other parts from disease of the brain or spinal marrow.

Treatment.—The variety of incontinence connected with an irritated state of the bladder, or an acrid condition of the urine, must be corrected by removing its cause. The proper remedies will be found under the heads of *irritable bladder, cystitis, nephritis,* and *lithiasis.* An anodyne enema is among the most effectual means of affording present relief. In the cases dependent on debility of the sphincter, such as nocturnal incontinence, the indications are to restore tone to the system at large, if debilitated, and to stimulate the sphincter. The first object is to be accomplished by the bitter tonics, mineral acids, chalybeates, sea-bathing, the cold bath, and due attention to clothing, diet, and exercise. For the latter purpose, astringents or tonics having a peculiar reference to the urinary organs may be first tried, such as uva ursi, pipsissewa, and pareira brava; and these may be aided by the cold douche to the sacrum, perineum, or pubes. Should these remedies fail, recourse may be had to the more active urinary stimulants, as buchu, cubebs, oil of turpentine, or cantharides; and galvanism has been found useful. Rhus radicans is thought sometimes to have acted favourably. On the whole, I have found no one of these remedies so effectual as cantharides, pushed so far as to produce slight irritation of the urinary passages. In bad cases, blisters to the sacrum may be employed. Strychnia and ergot have been recommended, in reference to a supposed power of stimulating the sphincter; and much may be hoped for from the former remedy. Narcotics also have proved useful in the nocturnal incontinence of children. They probably act by diminishing the susceptibility of the neck of the bladder, either directly, or through the nervous centres. Belladonna has answered an excellent purpose, and upon the whole is probably the most effectual remedy which has been employed. It should be given at bedtime, and continued for a week or two after the discharges have ceased. Lupulin might also be tried; and bromide of potassium has been recommended, from its supposed sedative influence on the urinary organs. The patient himself should be induced to aid the efforts of the practitioner. Much may be done by firm resolution on his part. Yet a resort to chastisement, recommended by some writers, in cases in which the will is not concerned, is not only cruel but nugatory; as the fears excited have of themselves a relaxing effect on the sphincter. Little or no drink should be allowed in the latter part of the day or evening; the patient should fully evacuate the bladder before going to sleep; and a good plan is to awaken him for the same purpose late at night, before the period at which he usually wets the bed. Any method which will serve to break the habit will often be found serviceable. When the complaint is connected with hysteria, the peculiar treatment adapted to that affection must be employed. In boys, troubled with nocturnal incontinence, a gum-elastic ring has been found effectual in controlling it.

In paralytic cases, remedies addressed to the spine, as mentioned under retention, will sometimes prove useful. The stimulating diuretics already enumerated may also be employed when the affection is local. Strychnia or nux vomica has been highly recommended, and electricity, or electro-magnetism, should not be neglected. Advantage is sometimes derived from powerful irritants, as cantharides or nitrate of silver, applied by means of bougies directly to the upper part of the urethra. Dr. Thos. Kennard has obtained very good results, in several cases, by the application to the perineum of an ointment, made of sulphate of morphia and veratria, each, ten grains, and an ounce of lard. (*Am. Journ. of Med. Sci.*, Jan. 1857, p. 69.) But very often all our remedies are of no avail, and we are compelled to content ourselves with measures to render the complaint as little inconvenient as possible. Pressure upon the urethra, by means of a spring-pad of moderate firmness, and the use of urinals at night, and water-proof bags in the day, to receive the urine as it dribbles from the patient, include about all the justifiable means at our command.

SECTION VI.

DISEASES OF THE NERVOUS SYSTEM.

SUBSECTION I.

DISEASES OF THE BRAIN.*

Article I.

INFLAMMATION OF THE BRAIN AND ITS MEMBRANES.

UNDER this head I propose to consider all the inflammatory affections of the parts contained within the cranium. Great difficulty has been experienced in arranging these affections. There would seem to be a propriety in treating separately of each distinct portion of the encephalon; of the several membranes, for example, of the brain itself, and the cerebellum; but, so far as our knowledge at present goes, the sigus of inflammation in these different parts,

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* *Cerebral Auscultation.*—In the year 1833, a paper was read by Dr. John D. Fisher, before the Boston Society for Medical Improvement, upon a peculiar sound called by him the *cephalic bellows sound*, which he had observed to accompany certain diseases of the brain. In a subsequent communication, made in 1838, he very much extended his former observations, and gave an account of the normal sounds heard upon auscultation over the brain, and of the modification produced in them by certain cerebral diseases. This dissertation was published in the *American Journal of Medical Sciences* for August of the same year (xxii. 278). In a subsequent volume of the Journal (Oct. 1843, N. S., vi. 281), is a communication upon the same subject by Dr. S. S. Whitney, of Newton, Massachusetts, in which the observations of Dr. Fisher are confirmed, and somewhat extended. The subject appears to be worthy of attention; and, accordingly, a brief abstract is here given of the statements made by the writers above mentioned.

Dr. Fisher recommends that the patient when ausculted should be in the horizontal position, that the head should be covered by a soft napkin, and that, in cases of children, the act should be performed during sleep. The sounds may be heard at any part of the surface of the cranium, but are most distinct at the summit. They are somewhat different before and after the closure of the anterior fontanel. The auscultation is best performed by the naked ear, applied to the surface of the cranium.

Four distinct sounds are observed in health; 1. the *cephalic sound of respiration*, produced by the passage of the air through the nasal cavities; 2. the *cephalic sound of the heart*, of a soft mellow character, seeming as if proceeding from a distance, and corresponding with the action of the heart; 3. the *cephalic sound of the voice;* and 4. the *cephalic sound of deglutition*, produced by the act of swallowing.

The most prominent abnormal sound is a modification of the cephalic sound of the heart, which Dr. Fisher calls the *cephalic bellows sound*. It is closely analogous to the cardiac murmur after which it is named. Dr. Fisher observed it in chronic hydrocephalus, in congestion of the brain, in acute meningitis with effusion, in abscess of the brain, in induration of that organ with effusion into the ventricles and at the base, and in compression of the brain from without. Dr. Whitney has noticed it also in inflammation of the brain without effusion, in ossification of the cerebral arteries, in aneurism of the basilar artery, and in certain hydrocephaloid conditions of the brain connected with anæmia. The explanation of this sound, given by Dr. Fisher, is that it is produced in the arteries at the base of the brain, and is consequent upon the diminution of their caliber, resulting from pressure upon them by effused fluids, congestion, &c. within the cranium. Dr. Whitney thinks that it is also generated by disease of the arteries themselves, as when their coats are altered by inflammation, or in aneurism.

Another modification of the cephalic sound of the heart, noticed by Dr. Fisher, occurred in several cases of apoplexy. Instead of being distant, it seemed to be near the ear, and was characterized by an impulse, as if the brain were suddenly raised against the cranium. He designates it as the *impulsive cephalic sound of the heart*.

An abnormal modification of the *cephalic sound of the voice* was noticed by Dr. Whitney, resembling almost precisely the ægophony of pleurisy, and arising from a similar cause;

as well as its causes, and the treatment which it requires, are so much alike, that it is almost impossible, and happily at the same time of little practical importance, to discriminate accurately between them.

It is true that inflammation may exist separately in the meninges and the substance of the brain. Dissection has demonstrated this fact. But the cases are rare, in which any considerable portion of one of these structures is affected without the other. This, indeed, is what might be inferred from their anatomical relations. The delicate arachnoid, so closely connected as it is with the pia mater, can scarcely suffer without involving that membrane, even if we admit that it is at all susceptible of inflammation; and the very office of the pia mater, which is in part at least to supply blood to the cortical portion of the brain, would appear to render the propagation of inflammation from one of these tissues to the other almost unavoidable. Nor is it easy to conceive, how any considerable portion of the periphery of the brain could become inflamed at once, except through the instrumentality of the investing membrane, through which alone a vascular communication is maintained between its distant parts. It seems improbable that general cerebritis could exist without a simultaneous meningitis.

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from a thin stratum of liquid, namely, between the surface of the brain and the internal surface of the cranium. It is called by Dr. Whitney *ægophony of the brain.*

The same observer notices two modifications of the cephalic bellows murmur, one of which occurred in aneurism of the basilar artery, and the other in anemic conditions of the brain. The first he describes as harsh, rough, and attended with a purring or vibratory thrill, that seemed to be communicated to the whole brain. It appeared to be of the same character with a *whizzing noise* which the patient complained of as a constant and annoying attendant on his disease. The second was a *cooing, chirping,* or *musical* sound, developed in the brain of anemic patients, and varied exceedingly by different degrees of pressure on the carotids. (*Note to the second edition.*)

At a much more recent period, A.D. 1856, Drs. Hennig and Wirthgen, of Leipsic, Germany, published the results of their investigations into the same subject, of which an abstract is given in the *B. and F. Medico-chirurgical Review* for April, 1857. In children from the twentieth week up to the sixth year, sounds may be heard by auscultation, either with or without the stethoscope, over the anterior fontanel, and sometimes over the posterior fontanel, and other parts of the cranium. The sounds are of two kinds; one heard before the third or fourth year, and the other afterwards. The former is blowing, and always intermittent; the latter more limited, and double like the sounds of the heart. A respiratory sound may also be heard, less frequent than the other sounds, being in the ratio of one to four. The intermittent blowing sound is ascribed, by Dr. Hennig, as heard over the large fontanel, to the pressure of the cerebral arteries on the sinuses. It is louder in proportion to the advance of ossification till completed, to the energy of the cardiac impulse, and the chlorotic condition of the blood. It ceases when the fontanel is perfectly closed. The murmur is absent in congestion of the brain or its membranes, in extensive encephalitis, in cerebral or meningeal tuberculosis, especially if attended with meningitis or serous effusion, and in extravasation of blood. (*Note to the fifth edition.*)

Still more recently, attention has been paid to the subject of cerebral auscultation by Dr. Henry Roger, Professor of the Medical Faculty of Paris, whose observations have extended to nearly 300 cases. The following is an abstract of his conclusions. It is only in young children that this method of diagnosis is likely to be of any service; as, after a certain period of early childhood, the most practised ear can detect no morbid murmurs, when applied to the cranium. Though Dr. Fisher prefers the ear, Dr. Roger has found the ordinary stethoscope to answer well, which should be held as the pen in writing. Dr. Roger did not succeed in perceiving the cephalic murmur over the whole head. It is most intense immediately over the anterior fontanel, and gradually diminishes, the further we proceed from that spot, till it becomes quite inaudible over the sides of the parietal bones, and over the occiput. The nasal respiratory murmur and the sound of deglutition may be heard over the whole head. The rale produced by laryngeal disease is more perceptible than over the chest. The pulse rales are not heard unless in rare cases. When the child speaks or cries, the sound is distinctly perceived, a remarkable resonance is heard through the cranium, and the voice seems as if it came out of the brain. Sometimes the two sounds of the heart are perceived. The cerebral or cephalic murmur may, according to Prof. Roger, be either healthy or morbid. (See *Am. Journ. of Med. Sci.*, Oct. 1862, p. 521.)—*Note to the sixth edition.*

All attempts have failed to establish an accurate diagnosis between inflammation of the meninges of the brain and its substance. There may be extreme cases in which probable inferences may be drawn from the symptoms; but, even in these, dissection has not always confirmed the decision of the judgment. It is only through their influence upon the cerebral functions, that the membranes can make their diseased condition known. Pain and fever, which are probably their sole independent effects, are common to so many diseases, that they could be considered alone as in no degree diagnostic. The delirium, convulsions, stupor, and coma, which serve to indicate meningitis, are cerebral phenomena, which might equally result from inflammation of the cortical substance, without that of the membranes. Both affections, therefore, express themselves, to a considerable extent, in the same manner. This at least is true of general or diffused inflammation of the two tissues. Nature thus appears to have made one disease of the affection, and is consistent with herself in requiring the same means of relief, in whichever position the disease may be prominently or exclusively seated. I cannot see the propriety of separating what she has put together, and shall, therefore, treat of general inflammation of the membranes and of the brain conjointly. There are frequent cases of local inflammation, which may be traced pretty confidently to the cerebral substance, whether the membranes may be involved or not. These I propose to consider separately.

There has been much confusion of nomenclature in relation to the cerebral inflammations. It is of little consequence what terms are used, provided they are employed with a fixed and definite meaning. In applying the name *meningitis* to the diffused inflammation, and *cerebritis* to the local, I wish it to be understood that the former does not exclude inflammation of the brain, nor the latter that of the membranes. I prefer these designations, partly because they are much used, and partly also because they serve to imply the fact, that, in the one complaint, the meninges are most prominently, and perhaps, in general, primarily affected, and, in the other, the proper tissue of the brain. There is a peculiar form of meningitis, which is so strongly characterized by the nature of its cause, and by its result, as to merit well to be distinctly treated of. It is that in which the inflammation is excited by the existence of tubercles, and which has, therefore, received the name of *tuberculous meningitis*. In these three divisions will be included all the forms of disease belonging to the present article.

I. MENINGITIS.

Syn.—*Phrenitis.*—*Meningo-encephalitis.*—*Encephalo-meningitis.*—*Encephalitis.*—*Arachnitis.*

THE reader will distinctly understand that, by this term, is here signified diffused inflammation of the cerebral membranes, either alone, or conjoined, as it generally is, with more or less inflammation of the brain itself. I am not sure that the old name of phrenitis is not better, as it would not be liable to mislead. Arachnitis, which was at one time popular, is wholly inappropriate; as the disease is seldom, perhaps never confined to the arachnoid; and, indeed, judging from its appearance upon dissection, as well as from its extreme delicacy, that membrane would seem to serve little other purpose in the disease than merely to admit the passage of the morbid products through its pores. Meningitis may be either acute or chronic.

Acute Meningitis.—This disease, as it occurs in children, is still frequently classed with *acute hydrocephalus*, though by far the greater number of the cases, usually called by that very inappropriate name, belong to *tuberculous meningitis*.

Symptoms, Course, &c.—The attack may be quite sudden, or it may be preceded by various preliminary symptoms, such as vague uneasiness, depression of spirits, wakefulness, vertigo, tinnitus aurium, and defective appetite. Along with the usual febrile phenomena which usher in acute inflammation, are conjoined intense headache, redness of the face, suffusion of the eyes, an excited or wild expression, giddiness, buzzing or roaring in the ears, and painful sensitiveness to light and sound, especially the former, so that the patient often closes his eyes forcibly, and the pupils, when they are open, are seen to be contracted, sometimes almost to the size of a pin-hole. Extreme restlessness, jactitation, and want of sleep are not uncommon symptoms; convulsive and spasmodic movements frequently occur; and sooner or later delirium generally sets in, sometimes calm, but, in the greater number of instances, more or less wild or violent. The pulse is frequent, hard, occasionally irregular or tumultuous; the respiration hurried, the skin hot, but often moist; and the tongue covered with a whitish fur, and sometimes clammy. Vomiting very often attends the complaint from the commencement, and is among its most characteristic symptoms. The bowels are usually constipated, though not invariably so.

After a length of time, differing greatly in different cases, unless the disease is interrupted, a new set of phenomena appear. The delirium yields gradually to drowsiness or stupor, from which the patient can at first be roused, giving vague and imperfectly articulated replies, but which deepens at length into coma. The pupils become dilated; sight and hearing are impaired; liquids often lie in the mouth without being swallowed, or are permitted to run out of it; strong irritants make little impression on the nostrils; and the sensibility of the skin is much diminished. Convulsions, though less violent than in the early stage, are still not unfrequently experienced. But rigidity of the muscles, and contraction of one or more of the limbs are apt to take the place of the general convulsive movements; and subsultus tendinum, with picking at the bed-clothes, or at supposed objects in the air, is not uncommon. The pulse, instead of being frequent as at first, often becomes slower and intermittent; and the respiration is interrupted with deep sighs. The urine is sometimes retained, and sometimes dribbles away without the consciousness of the patient; but, even in the latter case, it may accumulate so as greatly to distend the bladder.

At length signs of great exhaustion are added to those of cerebral oppression; the spasmodic contractions often give way to partial palsy or are mingled with it; the pulse becomes feeble, frequent, and thread-like; the skin cool, pale, and bathed in sweat; the features sunken and haggard; the sphincters relaxed; and the patient dies in a state of profound insensibility.

This is the more common course of the disease; but many of the symptoms are often absent; and diversities in the mode of their succession are not unfrequent. In many instances, the attack is ushered in with convulsions, upon the suspension of which the patient may either remain comatose, or reacquire consciousness; and these convulsions may be frequently repeated. In others, stupor or coma is the predominant symptom from the commencement. Occasionally the case begins with delirium, which may be at first moderate, and gradually increase in intensity; the patient walking about for some days before being confined; or may be violent or even furious from the outset. Sometimes severe pain is the only cerebral phenomenon connected with the fever during the greater part of its continuance; and there are now and then cases in which it precedes the general symptoms for a considerable time. In some rare instances, the disease has been known to commence with a sudden loss of speech. Finally, there have been cases so entirely destitute of the peculiar cerebral symptoms, that examination after death has given the first evidence of their nature.

Before leaving the subject of the symptomatology of the disease, it will be proper to make a few observations on some of the prominent phenomena. Perhaps the most constant of all the symptoms is *pain in the head*. It is seldom entirely absent from the commencement to the close, except when the brain becomes insensible from coma. Even when the patient is in a state of stupor, he will often, if roused, evince signs of cerebral uneasiness. In infants, it is indicated by their moans and cries, the contraction of their brow, the putting of the hand to the head, the rubbing or pressing of the head against the breast of the mother, the rolling of it from side to side, &c. It sometimes seems to occupy the whole head; sometimes is seated more especially in a particular part, as the forehead, the parietal region, or the occiput; and occasionally shoots from one part to another, or seems to come deeply from the interior of the brain. It is not unfrequently paroxysmal, being more acutely violent at certain times, and probably coming on like the darting pains of neuralgia, as evinced by the quick sharp screams sent forth by children, though immediately before quite tranquil.*

Vomiting is also a frequent and highly characteristic symptom, beginning often with the disease, and continuing more or less till the brain becomes torpid. It is wholly independent of disease existing in the stomach itself, and is undoubtedly in most instances cerebral. It is distinguished from mere gastric irritability, by the obstinacy with which it often resists all the means usually found effectual in allaying vomiting. It sometimes alternates with the pains in the head, and appears to relieve them.

Delirium does not generally come on until some time after the development of the disease, though occasionally it begins along with it, and even precedes all the other symptoms. In adults it is apt to be violent in the early stage, and is sometimes even furious, so that force is necessary to restrain the patient. Not only the intellect, but the senses also are frequently perverted, and the patient perceives unreal sights, sounds, and odours. He flies rapidly from thought to thought, talks almost incessantly, raves and screams, throws about the objects near him, and often attempts to rise from his bed, so as to require constant watching. In other instances, the delirium is more tranquil; but, in almost all cases, it is strikingly distinguished from the delirium of drunkards by the absence of fear. In the advanced stage, it is superseded by coma, but still frequently exhibits itself, though in a more depressed form, when the patient is roused.

The *convulsions* which occur at an early period are usually general, affecting all the limbs, and the muscles of the face. But in the more advanced stages, when the substance of the brain may be supposed to be more especially involved, they show frequently a partial tendency; affecting one-half of the body, one limb, or particular muscles, as those of the face, those which move the tongue, or those concerned in deglutition. Hence the grinding of the teeth, the stammering, the thrusting of the tongue out of the mouth, and the occasional difficulty of swallowing, which attend the complaint. Not unfrequently there is a persistent spasm, or rigidity of the muscles in this stage, and a tendency to contraction or flexion of the limbs. Towards the close, the involuntary movements take the form of subsultus, and carphologia; and complete relaxation or palsy of particular portions of the body not unfrequently occurs before death.

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* *Pain in the Knee.* Attention has been called by Dr. Lund, of Norway, to pain in the knee, occurring in children, as a diagnostic symptom of meningitis. It is said to occur in one-tenth of the cases. The pain is severe, persistent, increased by movement, and without swelling of the joint. It may attack both knees or only one. It occurs sometimes several days before the cerebral affection, and in that case may cease when the meningitis comes on, or may continue until the state of intelligence renders a determination upon this point impossible. In some instances, it does not manifest itself until the cerebral symptoms have begun. Though occurring as well in chronic as acute cases, it is severer in the latter. In the cases seen by Dr. Lund, the patients were of both sexes, and between the sixth and fourteenth year. I have not myself witnessed this phenomenon in meningitis; and it is probably less common in this country than in the higher latitudes of Norway. But for the occasional postponement of the affection until after the commencement of the cerebral symptoms, I should be disposed to consider the knee disease as an attack of subacute rheumatism, and the meningitis as a translation of this to the brain; and, even with this difficulty in the way of such a diagnosis, it still seems to me the most rational. (See *Am. J. of Med. Sci.*, Oct. 1864, p. 512.

The course and duration of the disease are very uncertain. Death sometimes takes place within the first twenty-four hours, more frequently between the fourth and seventh days, but still more frequently at a period varying from one to three weeks. The disease very seldom passes the seventh week. In the speedily fatal cases, death is usually preceded by convulsions. In these it has been observed that the brain is much less altered than often in old cases, in which the symptoms have been comparatively mild. The brain, like most other organs, has the power of accommodating itself to considerable change in its structure; but each increment of the new condition must be small, in order to be made with impunity. A strong sudden impression often completely paralyzes the organ, though the amount of physical effect may be very small, compared with that which the brain bears well, when made by a great number of successive slight impressions.

The disease may often be arrested in the first stage, or that of excitement, which sometimes runs on for ten days, two weeks, or more, but, in general, begins to give way to symptoms of collapse at the end of a week. In the second stage, marked by stupor, with rigidity of the muscles and diminished frequency of pulse, the chances of safety are much lessened. In the last stage, or that of profound coma, with or without paralytic affection, there is still less ground for hope. Recoveries are said to take place more frequently from secondary meningitis, occurring as an attendant upon other diseases, than when the complaint is original. It is a singular fact, noticed by several authors, that the disease sometimes assumes a regular intermittent form, having paroxysms daily or every other day, and ending at last like the ordinary form in coma. This may easily be accounted for when the patient resides in a miasmatic region; but it is said to occur in situations where there is no reason to suspect the existence of such a cause. The explanation, under the latter circumstances, must be sought for in the general law which governs the production of intermittent diseases. (See *vol.* i. *p.* 215.)

Anatomical Characters.—The dura mater is very seldom found to participate in the inflammation, unless the result of violence, or propagated from disease in some portion of the bony parietes. In such cases, it is detached from the cranium, which is whiter than natural; is reddened, thickened, ulcerated, or gangrenous; and is sometimes covered with a layer of coagulable lymph or pus. The same products are also found between it and the arachnoid, sometimes extending for a great distance. Dr. Samuel Wilkes, of Guy's Hospital, London, has noticed, as a distinguishing mark of inflammation of the dura mater, at least as he has seen it in children, and proceeding generally from disease or injury of the cranium, that the exudation is found on the free surface of the arachnoid; whereas, in ordinary meningitis in which the pia mater is the seat of the inflammation, the fibrinous or puruloid matter is almost always beneath the arachnoid, between it and the pia mater, or in the meshes of the latter membrane. (*Guy's Hosp. Rep.*, 1860, p. 119.) The arachnoid itself in acute inflammation undergoes singularly little change. Only here and there does it exhibit signs of a fine sanguineous injection. It is not unfrequently opaque or opalescent, and is said to be sometimes thickened, and to present numerous projecting points which render it rough to the finger. But Rilliet and Barthez state that, in several cases which they examined, this membrane retained its smoothness, gloss, and transparency, even when bathed with pus upon both sides. If the patient has died rather early, liquid pus is sometimes found spread over the surface of the membrane, which, at a later period of the disease, becomes concrete, resembling false membrane. (*Rilliet et Barthez.*) It can scarcely be doubted that layers of coagulable lymph are sometimes found in the same situation. But more frequently the effusion is observed beneath the arachnoid, in the tissue of the pia mater, which is infiltrated with serum or pus, in the former case appearing as though covered with a coating of gelatinous matter. The serum, however, escapes when the transparent arachnoid is punctured, and thus betrays the true nature of the phenomenon. The pus in the pia mater is sometimes liquid, and sometimes concrete, in the latter case appearing like yellow bands or patches. When freed from these liquids, the tissue of the pia mater is seen to be reddened. The membrane often adheres with considerable firmness to the brain, so that even portions of the cortical substance are torn away with it. The ventricles generally contain more or less fluid, which, when the inflammation has been slight, is usually perfectly limpid; but, when the lining membrane of the cavity has been much inflamed, is apt to be turbid with albuminous or fibrinous flocculi, or opaque and greenish from an admixture of pus. Sometimes blood is effused into the ventricles, or the general cavity of the arachnoid. The quantity of fluid in the ventricles, and in the meshes of the pia mater, varies from a few drachms to six or eight ounces or more. It is this phenomenon that has caused the disease, occurring in children, to be ranked with hydrocephalus. But the liquid is not unfrequently wanting.

In some instances, the brain appears to be perfectly sound; but much more frequently it exhibits signs of having participated in the inflammation. Occasionally it appears as if swollen, the convolutions being enlarged and flattened; and, when cut into, is found to be congested with blood. The cortical portion is reddened, and sometimes much softened, so that parts of it are removed with the pia mater; and the cut surface of the medullary portion is thickly dotted with red spots, or diversified with small streaks or stains of blood. Parts of the medulla are also softened, though, in some instances, this tissue is said to be rendered more dense than in health. The cerebellum exhibits phenomena altogether analogous to those presented by the brain.

Attempts have been made to point out the symptoms which indicate especially inflammation of the membranes in this affection, and those which depend upon lesions of the brain. Pain, fever, delirium, and general convulsions are supposed to be meningeal symptoms, arising from irritation propagated to the cerebral substance; and the coma and diminished or abolished sensibility of the advanced stages, have been ascribed to the pressure of the effused products; while muscular rigidity, contraction of the limbs, and partial palsy have been referred to inflammation of the brain. There can be no doubt that the meningeal symptoms above referred to may be the result of inflammation of the membranes alone; but they may also proceed from the same disease in the brain; and, though the contractions and palsy are often cerebral, there can be no reason that I can understand why they may not also spring from a partial pressure by the effused fluid, or a partial irritation extended to particular portions of the cerebral mass, without any positive inflammation of the latter structure.

Causes.—The predisposing causes of meningitis are numerous. One of them, common to this and other inflammations, is a rich plethoric state of the blood. Persons of a sanguine temperament, and those of a short neck, and holeric temper, are said to be more liable to it than others of a different con- itution. There is every reason to believe that a tendency to the disease is ometimes inherited. *Age* has considerable influence over the predisposition. arly infancy, and vigorous manhood are supposed to promote it. The dis- ase is not uncommon in new-born infants, and in those under two years. fter that age, the susceptibility appears to diminish until about the period f puberty, when it again increases, not to decline until the commencement f the decline of life. Acute meningitis is asserted to be most frequent be- ween fifteen and forty-five. It is singular that the tendencies to tuberculous eningitis are exactly the reverse, being greatest between two and fifteen. uersent states, as the result of his own observation, that the proportion of ases of ordinary meningitis to the tuberculous, at this period of life, is as wo to twelve. (*Dict. de Méd.*, xix. 411.) *Males* are much more liable to the isease than *females*. MM. Parent and Martinet give the proportion of males o that of females as four to one. This is a greater disparity than can be ac- ounted for from accidental causes, and must have its foundation in some in- erent difference between the sexes. The occupation and habits of the indi- idual contribute much to modify the susceptibility to cerebral inflammation. *rofessions* which demand excessive mental exertion, or occasion great men- l anxiety, or necessarily expose much to the sun, act as predisposing causes. he same may be said of *intemperance* in drinking and eating. *Hot climates* ave a similar effect. *Hypertrophy of the left ventricle of the heart*, espe- ially when dependent on obstruction in the aorta below the origin of the arotids, necessarily keeps up an active congestion of the brain, and predisposes to inflammation. The disease has sometimes occurred epidemically.

Exciting causes are blows, falls, &c. upon the head, especially among chil- ren; exposure of the head unprotected to the direct rays of the sun, or to an tense artificial heat; an habitually dependent position of the head; violent ental excitement or disturbance of any kind; excessive bodily exertion; buse of alcoholic drinks; venereal excesses; the irritation of teething; the anslation of gout or rheumatism; the suppression of accustomed discharges; he retrocession of cutaneous eruptions; and various febrile diseases, especially yphoid fever, erysipelas, and scarlatina. Meningitis is a not very unfrequent equela of the last-mentioned disease. Erysipelas may produce it by a direct ropagation of irritation through the skull, or up the auditory or nasal passages. mong the frequent causes of it, deserving of a particular attention, are caries f the bones of the ear, of the ethmoidal bone, and of the cranium itself. It is ot uncommon for disease of the ear to be extended to the brain with fatal fects. Even ordinary otitis, without any affection of the bones, has been pro- agated to the cerebellum. (*Med. T. & Gaz.*, Aug. 1863, p. 126.) A case of eath from cerebral inflammation occurred to me, which depended upon caries f the interior bones of the nose. In all these cases, an irritation is extended to he dura mater by the diseased bone in its vicinity, and from that membrane propagated to the other membranes, and to the brain. The meningeal seiz- re may generally be known by the occurrence of a chill, followed by fever, omiting, delirium, convulsions, and ultimately coma; and I have known more han one instance, in which repeated chills, with trembling, occurring irregu- arly, have marked the early stage of the cerebral affection. These symp- oms are usually preceded by severe and sometimes excruciating headache. ebert states that, in cases of extension of disease from the bones of the ear o the brain, the cerebral sinuses are the first to suffer; and, after death, these re seen filled with pus, especially the transverse and petrosal sinuses. (*Vir- how's Archiv. für Pathol. Anat.*, ix. 381.)

Diagnosis.—The disease most liable to be confounded with simple menin- gitis is tuberculous meningitis. The diagnosis between them will be given when the latter disease is considered.

Many fevers, also, in their early stages, bear considerable resemblance to the complaint under consideration. This is especially the case with enteric or typhoid fever and small-pox. Fever, headache, and delirium are sometimes, for a period, the only striking symptoms of meningitis; and they are all frequently present in the diseases just alluded to. In some instances, it is impossible for a time to discriminate accurately between them. But, generally speaking, in each affection, these common phenomena are mingled with peculiar symptoms which serve as the basis of a probable diagnosis; and, when this is not the case, such symptoms soon become developed in the progress of the disease. It would be repetition to detail these diagnostic symptoms here. The reader is referred to the several diseases alluded to. The absence of the peculiar phenomena of other febrile affections, the severity and persistence of the headache, the obstinate vomiting, the not unfrequent convulsive movements, the contracted pupil and exaggerated sensibility, will generally serve to distinguish meningitis in its early stages. In the advanced, the symptoms are so characteristic as scarcely to admit of mistake.

But there is another condition of the brain which it is still more important to distinguish from acute meningitis. I allude to a state of delirium which sometimes shows itself in debilitated conditions of the system, and, so far from being essentially connected with inflammation, is in fact dependent upon the want of due energy in the cerebral functions. Such a condition occurs in the delirium of drunkards. (See *Delirium Tremens.*) It comes on sometimes also in individuals, exhausted by the loss of blood, by starvation, by long-continued diarrhœa, or by other debilitating diseases. I have seen it occur in the course of exanthematous affections, in which it is attended with a disappearance of the eruption, and might readily be mistaken for cerebral inflammation, consequent upon a retrocession of the cutaneous affection; whereas this subsides, in such cases, solely in consequence of the prostrated state of the circulation. The delirium may have the appearance of greater or less violence, or it may be of a low character. It may be followed by symptoms of coma, with dilated pupil, insensibility to light, &c.; or this may be the original form which the cerebral affection may assume. It is important not to mistake this condition for acute meningitis; because it demands an exactly opposite treatment, and often yields readily to stimulants, which would prove fatal in that complaint. It may generally be distinguished, in connection with the previous state of the patient's health, by the paleness of face, the frequent collapse of the features, the coolness and inactivity of the surface, the feebleness of pulse, the tremors of debility, and the want of that fearlessness so characteristic of the delirium in acute meningitis.

Treatment.—It is of the utmost importance to begin the treatment early. By energetic measures at this period, the patient can generally be saved. Beyond all comparison the most effectual remedy is bleeding. The pulse is usually tense, and the loss of blood is well borne. The quantity taken must be regulated by the constitution of the patient, and the effects produced upon the pulse. It is always safe to continue the bleeding until the pulse begins perceptibly to flag, except only in the case of hypertrophy of the left ventricle of the heart. From twelve to twenty-four ounces may be taken from an adult at one operation, and the bleeding repeated once, twice, thrice, or even oftener, in as many days, if the pulse remain tense, and the active cerebral symptoms unabated; but the quantity abstracted at the subsequent bleedings should generally be less than at the first. After a decided impression has been made upon the pulse by general bleeding, cups or leeches to the temples, behind the ears, or to the scalp, should be freely employed. Leeches are preferable to cups, as they disturb the patient less when skilfully applied. They are peculiarly adapted to infants. Some writers, especially the French, strongly recommend leeches to the anus. I believe they are more effectual upon the head. A good plan is to shave off the hair, and apply them to the scalp. I would repeat that a vast deal depends, as to the result of treatment in simple acute meningitis, upon early and vigorous bleeding, both general and local.

Active purging is also highly useful; more so perhaps in this than in most other inflammatory affections. Calomel is especially adapted to the disease, in consequence of being thrown off from the stomach with greater difficulty than most other cathartics. It should be given in full purgative doses; and its operation should be promoted by the subsequent administration of the infusion of senna with Epsom salt, or other similar combination. This plan is peculiarly suited to young children. For adults, combinations of calomel with other active cathartics, as the extract of jalap, or the compound extract of colocynth, may be preferable, in some instances, by ensuring a more speedy action. The purging should be continued afterwards, every day or every other day, by means of one of the saline cathartics, or of these with senna tea. Croton oil sometimes answers an excellent purpose, when there is difficulty in administering medicines in large doses. Elaterium has been recommended when there is reason to suppose that effusion has taken place.

In the intervals of the above treatment, if the stomach is retentive and not nauseated, tartar emetic may be given in doses varying from the eighth to the quarter of a grain every two hours. The production of some nausea is not objectionable, as it tends powerfully to lessen the force of the cerebral circulation, and is the means which nature herself very frequently takes to procure relief. Positive emesis is not desirable unless when the stomach may happen to be overloaded; as, in the act of vomiting, cerebral congestion is produced, and there may be some danger of aggravating the inflammation.

Local measures in this stage are also very useful. The hair should be removed either by the razor or scissors, and cold applications made to the scalp. To be effectual, the cold must be steadily applied; as, if employed intermittingly, it might produce as much harm by the reaction it occasions as good by its primary sedative influence. Some have recommended evaporating lotions, as of alcohol or ether. But these are not sufficiently energetic, and, in this stage, the inhalation of the vapours might prove seriously detrimental. The best application is ice, pounded or in small fragments, and contained in a large bladder or caoutchouc bag, only partly filled, so that it may be fitted to the head. Care must be taken not to continue the application so long as to endanger the loss of life in the skin. It should, therefore, be removed for a time, especially if painful to the patient, and reapplied before reaction takes place. Should ice not be attainable, very cold water may be substituted, and may be applied either by means of linen cloths folded several times, and renewed as fast as the water with which they are soaked becomes warm; or of a large sponge, hollowed out so as to fit the head, and kept saturated with the liquid. Another plan of employing cold water, said to be very efficient in controlling cerebral excitement, is to direct a slender stream of the liquid, cooled by ice, from the height of two or three feet, upon the scalp; care being taken, by a suitable arrangement of oiled silk about the neck and breast, to protect them from the wet. By contriving a gutter in the silk, the water may be conveyed off as fast as it falls. The depressing influence of this remedy is so great, that the practitioner should always superintend its application, at least until the attendants shall have acquired the requisite skill. It may be continued from fifteen minutes to an hour at a time, and renewed as occasion may require; but in the intervals the scalp should not be allowed to become hot or turgid from reaction. Some recommend a constant dropping of cold water, which may be effected by pouring it upon a sponge placed in a funnel, suspended over the head of the patient.

While cold is thus employed to the head, the feet may be soaked in hot water, or sinapisms applied to the legs, more especially when the extremities have a disposition to be cool. In infantile cases, the warm bath is often beneficial by its sedative effects. It should be only tepid and not hot; as in the latter state it is too stimulating. Sometimes advantage may accrue from cold to the head, while the body is immersed in the bath.

Another method of lessening the flow of blood to the head has been proposed. It consists in making pressure upon the carotids, so as to diminish the amount of blood passing through them. It is said that this measure sometimes has a very striking effect in abating cerebral excitement. To be of any permanent benefit, it must be repeated frequently, and would require the constant presence of the practitioner, with a skill in manipulation which is not always possessed. It may be useful sometimes in cases of obstinate convulsions, which refuse to yield to the ordinary means.

Unfortunately opiates cannot be employed with propriety in the early stage of meningitis, in consequence of their property of stimulating the brain; and the same objection applies to most of the anodyne narcotics. Perhaps the inhalation of chloroform, which, I believe, operates as a cerebral sedative, might be found not only safe, but useful. I have not, however, used it under these circumstances. American hellebore might also be used, in reference to its property of lowering the pulse, in cases unattended with vomiting.

During the treatment, the patient should lie in a cool well ventilated apartment, with his head somewhat elevated. For the first day or two, his diet may be restricted to gum-water, and, throughout the stage of excitement, should be of the lowest kind.

The remedies above recommended are applicable to the stage of excitement, while the pulse is still active, and headache, delirium, convulsions, &c. indicate irritation of the brain. There is one other which has not yet been mentioned, because adapted rather to the intermediate stage between excitement and collapse, than to the first stage. I allude to mercury in reference to its constitutional influence. Should depletion have failed to subvert the disease, or should the case not be seen until too late for the effectual use of that measure, mercury should be used both internally and externally, so as to bring the system as quickly as possible under its influence. Calomel or the mercurial pill should be given in small and frequently repeated doses, and mercurial ointment freely rubbed upon the inside of the limbs, and applied to blistered surfaces, if any such exist. The remedy should be suspended as soon as its effects become evident in the mouth.

Coincident with the use of the mercurial, it may be found advisable to substitute an emollient poultice to the scalp for cold applications. When symptoms of depression begin to appear, marked by a diminished frequency of pulse, coolness of the surface, and a disposition to stupor, with dilated pupil, &c., recourse should be had without hesitation to a blister to the scalp. I believe this to be a very efficient remedy in simple meningitis, when properly timed; perhaps the most efficient, after bleeding, purging, and mercury. It is generally postponed too long, and, being applied when no remedy can be of much avail, has of course failed. I am quite certain that I have often seen it produce the most happy effects, under the circumstances alluded to. There is much more danger of deferring it too long than of employing it too early. It may be resorted to as soon as depletion ceases to be indicated, from the weakness of the pulse, or other signs of depression. To do good, moreover, it must be large, so as to cover the whole scalp; and must be kept on from twelve to twenty-four hours. Small blisters serve only to vex the patient if still sensible. They exert little influence over the disease. Nor have I seen much good from them applied to the back of the neck in acute meningitis. The scalp, and the whole scalp is the proper seat for them. Mercury and blisters are the remedies chiefly to be relied on, in the stage of the disease intermediate between that of excitement and that of collapse.

Should the complaint be connected with the retrocession of a cutaneous eruption, or of external gout or rheumatism, hot water, rubefacients, or blisters to the former seat of disease are especially indicated. If the external affection was of an eruptive character, it may be best to attempt to imitate it, as nearly as possible, by pustulation with croton oil or tartar emetic.

Occasionally symptoms of great prostration ensue upon the cure of the inflammation, requiring the use of tonics, stimulants, and nutritious food, to prevent fatal results. The symptoms of this state may, in some measure, simulate those of profound cerebral disease, which mark the closing stage of the worst cases. The inference is, that, when the signs of great debility are present in the last stage, stimulants may be resorted to; as, if the symptoms are organic, death must necessarily take place, so that they can do no harm; while, if merely functional, they may be the means of saving life.

Opiates, though entirely forbidden in the early stage, may sometimes be safely and usefully employed to control the restlessness remaining after the inflammation has gone. A mixture of chloroform and camphor may be used for the same purpose.

Throughout the complaint, attention should be directed to the bladder, and the urine drawn off by a catheter, if necessary.

Much may be done in the way of prevention. Thus, the existence of chronic otitis or ozæna should lead to measures for the cure of these affections, so as to obviate this source of cerebral inflammation. Attention to the gums during teething is also particularly required, in those who may be suspected of the least predisposition to meningitis. (See *Morbid Dentition.*) A consideration of the various causes of this disease will suggest other preventive measures, under similar circumstances of constitutional tendency. As relapses are peculiarly dangerous, great care should be taken, during convalescence, to prevent premature exposure to these causes.

Chronic Meningitis.—Chronic meningitis, uncomplicated with tubercles, has not yet been fully investigated. The most detailed account that I have seen of its symptoms and anatomical characters, in the form which it ordinarily assumes, is that given by Bayle. The disease may either be original, or the consequence of acute meningitis. The phenomena which it usually presents, when commencing in the chronic grade, are those of insanity. At first there is generally some exaltation of the cerebral functions. The patient exhibits an extraordinary eagerness in some particular pursuit, or is under the influence of some exaggerated passion, as pride, vanity, or ambition; and is very apt to be possessed by some monomaniacal notion or propensity. He is generally restless, talks and gesticulates much and rapidly, has a flushed face, and often some excitement of the pulse. In other instances, he is apathetic, dejected, or gloomy, and not unfrequently tormented with imaginary apprehensions. In this stage of the disease, the general functions are little impaired; the appetite is often good; and the patient, unless emaciated by the wearing effects of want of sleep, may even gain flesh.

After a longer or shorter period, this state of exaltation is followed by a failure both of the physical and mental powers. This is usually first shown in the muscular movements. A not unfrequent phenomenon, even in the early stage, is some hesitancy of speech, and a kind of stammering when the patient attempts to pronounce certain words. Afterwards a degree of stiffness or uncertainty may be noticed in the motions, as if the muscles were somewhat rigid. Paralysis at length shows itself, and gradually increases. The lower limbs are especially affected, and lose in the end both sensibility and power of motion, so that the patient is confined to his bed. At the same time, the muscles concerned in speech are so much affected that he can scarcely articulate intelligibly. The sphincters finally give way, and involuntary discharges follow. The mental imbecility keeps pace with the failure of physical strength, and before death the patient is often reduced to the lowest condition of idiocy and paralysis. Sometimes, in the course of the disease, he is affected with spasms, and even with regular epileptic convulsions.

In some instances, the chronic affection appears chiefly in the form of epilepsy; and this happens especially when the disease follows an acute attack. In others, there is reason to believe that symptoms of chronic hydrocephalus are the result of this grade of cerebro-meningeal inflammation.

The duration of the affection is very uncertain. Sometimes it runs its course in a few months, sometimes continues for years. It is always dangerous; and, in the advanced stage, is generally hopeless. In its early stage, it may probably very often be cured by appropriate treatment; at least, patients exhibiting all the characteristic symptoms of the complaint often get well; though it is impossible to decide with certainty, under these circumstances, whether or not meningitis really existed. Sometimes the patient is carried off by a supervening acute attack.

The *anatomical characters* as observed by Bayle are the following. The *arachnoid* upon the convex surface of the brain, and on the inner surface of the hemisphere, is opaque and thickened, sometimes as thick even as the dura mater, and resembling parchment soaked in water. In some cases, patches of false membrane, of various thickness, either opaque or translucent, may be seen adhering both to the cerebral and the parietal surfaces of the arachnoid. Adhesions between the opposite surfaces of this membrane are not very uncommon, especially in the great fissure. The *pia mater* of the convolutions is red and thickened, and more or less loaded with bloody or serous effusion. Sometimes it adheres to the cortical portion so firmly, that, when torn away, it brings parts of the latter along with it. This membrane is also thickened in the ventricles, where it is not unfrequently rough with numerous projecting points like grains of sand; and similar minute prominences occasionally appear on the convex surface. The *ventricles* almost always contain an abnormal quantity of serum, which is also in excess in the general arachnoid cavity, and in the tissue of the pia mater. The quantity of fluid is sometimes six or eight ounces, and entitles the case to be considered as hydrocephalic[*]

It is somewhat singular that the cerebellum very seldom participates in the inflammation. The serous membranes throughout the body are very apt to be inflamed, and the disease is often complicated, before its close, with gastro-enteric inflammation, the marks of which are obvious after death.

Of the treatment of *chronic meningitis*, it is necessary to say little in this place. As the disease generally exhibits itself by symptoms of insanity, it is under that affection that the remedies must be particularly considered. It is sufficient now to state, that the general principles which govern the treatment of the acute disease are applicable to this also, though the measures must be more moderately used. In addition to general or local bleeding, purging, mercury, blisters, setons, &c., recourse must be had to moral agencies, which are often the most effectual remedies for a chronically diseased brain.

There is another form of chronic meningitis, which has been particularly described by Dr. R. H. Goolden, of London. It is analogous to external periostitis, and may be associated with syphilis, though it has no necessary connection with that disease. Pain in the head is the most prominent symptom.

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[*] For cases of this affection recorded at length, the reader is referred to a valuable paper by Dr. Pliny Earle, of the Bloomingdale Asylum, N. Y., in the *American Journal of Medical Sciences* (N. S., xiii. 333).

usually at first paroxysmal, and occurring especially at night, but at length becoming more or less constant. It is very often severe. If it be not arrested, weakness of the lower limbs comes on, ending in paralysis; epileptic convulsions occasionally take place; and the patient becomes desponding, emaciated, and affected with night-sweats. The disease yields to iodide of potassium with sarsaparilla, opiates at night, and a blister to the head. (*Lond. Lancet*, May 16 and Aug. 23, 1851.)

II. CEREBRITIS.

Syn.—*Partial Inflammation of the Brain.*

As it is scarcely possible that general inflammation of the brain should exist without involving the membranes extensively, and thus coming under the preceding head, the term cerebritis is here confined to partial or local inflammation of the cerebral substance, in which, though portions of the membranes are sometimes concerned, yet they are so secondarily and quite locally, and are of comparatively little account either in the symptoms or the result.

Symptoms, Course, &c.—The symptoms vary considerably with the extent of brain affected, the degree of the inflammation, and the greater or less rapidity of its progress. It might be supposed also that they would differ with the part of the brain inflamed; but it is surprising how little can be learned from the symptoms in relation to the precise position of the disease. In consequence, however, of the decussation of the fibres from the opposite hemispheres, before leaving the cranial cavity, the appearance of the exterior effects of cerebral inflammation, upon either side of the body exclusively, may be considered as a proof that the inflammation is situated in the opposite side of the brain; and, when both sides of the body are affected, it may be inferred that both portions of the brain are inflamed, or at least that, if the inflammation is confined to one side, it is sufficiently near the median line to extend a powerful irritation to the other.

The symptoms, as they ordinarily occur, may be divided into three stages, which, however, are often confused, or follow each other at irregular intervals, and sometimes appear, in rapid cases, almost concentrated into one.

First stage.—Headache is a very frequent attendant on the early stage of cerebritis, and often precedes, for a considerable time, all other symptoms. The patient complains of a severe pain, occurring paroxysmally, sometimes in one, sometimes in another part of the head, but usually feeling as if it came from the very centre. Along with this symptom, either from the commencement, or after a variable length of time in different cases, other deranged sensations are experienced, as vertigo or dizziness, occasional faintness, temporary dimness or perversion of vision, buzzing or roaring in the ears, nausea or loss of appetite, and feelings of slight tingling in different parts of the body. There is very often upon the countenance an expression of seriousness, sadness, or self-concentration; or the patient is restless, agitated, and unable to sleep; or he may be morose or irascible, or disturbed by mental illusions. After a time, the sensations above referred to become more decided and characteristic. Neuralgic pains, or the tingling and formication which are usually intimated when we say that a part is asleep, or feelings of numbness are experienced in some particular portion of the body, as a limb, for example; and the patient is not unfrequently affected with convulsive movements, which may be either general, or confined to one side.

Occasionally there is fever, with accelerated circulation, heat of skin, flushed face, furred tongue, &c.; but more frequently the pulse, so far from being excited, is quite as slow as in health, or even slower; being in some instances not more than fifty or sixty in a minute, and at the same time feeble and irregular. This irregularity is occasionally a striking symptom. At one moment the pulse will be very slow, then more frequent; and this alternation may recur at short intervals, as often even as several times in a minute. The surface, too, is rather cool and pale, and the face usually pale, though liable to be flushed suddenly, especially upon the occurrence of a spasmodic paroxysm. This condition of the circulation and of the surface is the more important, as it may mislead the practitioner, if not upon his guard, and induce him to attribute the phenomena to debility. The cause of the depression is probably the loss of power in the inflamed cerebral mass, which prevents it from sending forth the influences requisite to preserve the organic actions in their healthy state.

Through all these symptoms the headache continues with unabated violence; still, however, occurring somewhat paroxysmally, and, even in cases in which it is seldom or never quite absent, being at one time much more violent than at another. It is very frequently associated with vomiting, which is a characteristic symptom of the disease. I have often observed, in these cases, that, during the continuance of the nausea and vomiting, or a tendency to them, the headache is less severe, and in some instances ceases for a time.

The symptoms above enumerated may be considered as marking the first stage of the disease, that probably of inflammatory congestion. The complaint may often be arrested in this stage by appropriate remedies, or, if the portion of brain affected be extensive, or the inflammation violent, may terminate in a speedy death, preceded by convulsions or coma, or by both.

Second stage.—If the disease continue, other phenomena make their appearance. A certain rigidity or continuous spasm is often observed in the muscles of some part of the body, of one limb, for example, or of both limbs on the same side; or possibly it may be confined to a single muscle: and the flexors are almost always preferably affected, so that the hand is fixedly bent on the wrist, or the forearm upon the arm, or the leg upon the thigh. Attempts to overcome this spasm are resisted by the muscles, and often occasion severe pain to the patient, so as to extort cries from him, even though in a partially comatose state. Along with this tonic spasm, there are not unfrequently sudden startings or twitchings of the muscles, or convulsive movements of one side of the body or of both, with sensations of numbness or tingling, and a want of control over the limb. The face, eyes, tongue, or throat, may be the seat of these disorders of sensation and motion; and hence occasional distortion of the features, squinting, stammering, or other defect of speech, and difficulty of swallowing. The pupils are little sensible to light, and are often largely dilated; and there is not unfrequently a want of correspondence between them; one being dilated, while the other is natural, or possibly somewhat contracted. The sight of one eye, moreover, may be affected while that of the other remains unimpaired.

Though the patient is seldom affected with violent delirium, yet the mental faculties are obviously deranged. Sometimes he is sombre, morose, or indifferent to everything around him, as if absorbed in his own sufferings. There is often forgetfulness, especially of particular words, with confusion and incoherency of thought, or a tendency to drowsiness, and sometimes temporary unconsciousness.

These symptoms are supposed generally to indicate the occurrence of softening of the cerebral substance. The most characteristic of them are the rigid contractions of the flexors, and a commencement of paralysis both of sensation and motion. The contractions alluded to are not, however, present in all instances. The disease may prove fatal at this period, without advancing into the third stage. In this case, either a convulsive paroxysm may carry off the patient, or he may sink into a state of collapse, with a very feeble and frequent pulse, counting sometimes 140 or 160 in the minute, a cold skin, and slow respiration, soon followed by death.

Third stage.—The third stage is that of paralysis, with a more decided disposition to stupor. The portion of brain affected has become completely disorganized, having probably fallen into the last stage of softening, or dissolved into pus. The limb or limbs, before perhaps partially contracted and partially paralyzed, now lose all sensation and power of motion; other parts become involved in the same loss of power; the senses of sight, hearing, &c. fail; the sphincters give way; and the patient dies at last, having been reduced, both mentally and bodily, to the lowest condition of helplessness.

The duration of the disease, and the course of its symptoms are liable to great diversities. Sometimes when the inflammation is violent or extensive, and especially when the cineritious portion of the brain is affected, the progress is very rapid. Convulsions may carry off the patient in two or three days from the first attack; or a short period of febrile excitement, headache, delirium, &c. may be followed by coma, with or without the muscular contractions and paralysis, and prove fatal within one, two, or three weeks. But more frequently the disease runs on much longer, and often continues for months, and sometimes for years, before completing its course.

The sketch above given is very general, and does not aim to include all the derangements of function which occur in the progress of the complaint, or all the diversities of association or succession which the symptoms enumerated exhibit in different cases. Such elaborate minuteness is incompatible with the limits of this work, and is unnecessary for all practical purposes. One or two of these varieties it may be proper to notice.

Like the form of cerebral inflammation denominated in this work meningitis, the one now under consideration is disposed to assume the remittent form, and is occasionally to all appearance regularly intermittent, having a paroxysm daily or every other day, at the same hour. The violent headache, delirium, convulsions, or coma, constituting the paroxysms, vanish entirely during the intermission; and it would seem impossible that a patient, bearing so nearly the aspect of health, should be labouring under inflammation of the brain. Sooner or later, one of the paroxysms unless interrupted proves fatal, and dissection reveals softening, or an abscess in the brain. The explanation given of intermittent meningitis is equally applicable to this affection.

In some instances, the course of the disease is affected by the supervention of diffused inflammation of the meninges. When, after a period of violent headache, vomiting, and more or less of the local effects already described, without much disturbance of the circulation or of the mental faculties, there comes on suddenly a condition of high febrile excitement, with a frequent pulse, heat of skin, flushed face, active delirium, and a tendency to convulsions, there is good reason to suspect that an inflammation, commencing in the cerebral substance, has extended to the membranes.

Anatomical Characters.—In cases which have eventuated in a speedy death, nothing more may be found than congestion, more or less intense, of a portion and sometimes an extensive portion of the brain. Such cases, however, are almost always connected with meningeal inflammation.

In pure cerebritis, the texture of the cerebral substance is usually changed. Sometimes the alteration is confined to one spot, sometimes is found in two or more. It may be either at the circumference or towards the centre; but is most frequent in the cortical or cineritious portion. The character of the alteration is different, according to the stage at which the disease may have proved fatal; and it also presents somewhat different appearances, according as it occupies the cineritious or white structure.

In the earlier stage, when the part affected is divided by the scalpel, and especially when it belongs to the cortical substance, the cut surface exhibits innumerable red points mingled with the natural colour, or stains of a rosy, violaceous, or reddish-brown hue, imparting to it a marbled appearance. The consistence is considerably softer than in health, and the structure may readily be broken up into a soft pulp, of a reddish colour. Sometimes, however, instead of being softer, the part is firmer than in health, though at the same time more brittle. The colour is owing to the incorporation of blood in different degrees with the cerebral matter, and thus various shades are presented of deep red, rose-colour, violet, brown, &c. This appearance is denominated *the red softening.*

In a more advanced stage, pus may be seen infiltrated into the cerebral tissue, and mixed in various proportions with the blood, which, according to some pathologists, is converted into it. The structure is now completely softened, of a semi-liquid consistence, and as if dissolved in the purulent liquid. The colour is modified by the pus, and presents various shades of brown, chocolate, greenish, gray, &c., until at last the colour of blood is entirely lost, and only the yellowness of the pus remains. In this state the appearance is denominated *yellow softening.* Both the red and yellow softening may sometimes be seen in the same brain. Not unfrequently small extravasated portions of blood exist in the altered tissue, of a dark-red or nearly black colour, and varying in dimensions from the size of a shot to that of a small cherry, or larger. The softening may also be gangrenous, of a grayish or brownish colour, sanious, and very fetid.

Occasionally it happens that pus is found infiltrated in the cerebral tissue unsoftened. Sometimes it forms cavities or *abscesses* in the brain; the proper tissue having been completely broken down, and absorbed or dissolved in the pus. These cerebral abscesses are very apt to follow inflammation from injuries of the head. They are sometimes formed with great rapidity, even in the course of three or four days, or a shorter time. They differ greatly in size, occupying spaces varying from a few lines in extent, or a single convolution of the brain, to a whole hemisphere. There may be several of them or only one. The pus may be perfectly well formed and inodorous, or it may be flocculent, ichorous, or fetid; and not unfrequently portions of the cerebral blood-vessels, and fragments of the cerebral tissue, are mixed with the pus of the abscesses. These may open into the ventricles, or on the surface of the brain, and have sometimes even made their way externally through the mastoid cells, or the petrous portion of the temporal bone.

In some of these abscesses, there is no sign whatever of inflammation in the substance of the brain about them, and none of the usual symptoms of that affection have existed during life. In such cases, it has been supposed that the pus, as in the metastatic abscess in other parts, may have been deposited from the blood-vessels without inflammation in the part, being either the result of phlebitis, or absorbed from some exterior source. The reader, however, is aware that a somewhat different view of the formation of such abscesses is entertained by the author. (See *Purulent Infection*, page 281.)

Abscesses are sometimes found enclosed in a sort of cyst of false membrane, and it has been ascertained that this is produced after the deposition of the pus. The liquid being thus isolated, is prevented from exercising its disorganizing influence on the brain; so that the cyst is no doubt, in this situation as elsewhere, the result of a self-protective effort of nature.

The symptoms produced by abscesses are the same as those which result from softening of the brain.

Instances of softening have been observed in which no pus could be discovered.

A variety of softening has been noticed, especially in the medullary portion of the brain, in which the diseased part was of a milky whiteness, and of a shining satin-like appearance, without signs of either blood or pus. Dr. Abercrombie considered it as in some instances the product of inflammation, and as the result of gangrene consequent upon the interruption of the circulation by that process. This appearance has been distinguished by the name of *white softening*.

The extent of the softened parts varies greatly. It may be less than an inch, it may be several inches, or it may be commensurate with one of the hemispheres.

It has been a question whether softening of the brain is always the result of inflammation. In many instances, it undoubtedly is so; but it is now generally admitted, as maintained by Rostan, that the white softening may occur without inflammation. Instances are now and then observed, in which no unequivocal mark of inflammation can be discovered in the neighbourhood of the affected part, and no sign whatever of cerebritis existed during life. It is especially apt to occur in cases of ossified blood-vessels, and has been ascribed to gangrene resulting from that cause. As proved by Hasse, it sometimes depends on obliteration of the cerebral arteries, consequent on coagulation of the blood. (*Archives Générales, 4e sér.*, xiv. 217.) It has followed the tying of the carotid arteries. Dr. W. Senhouse Kirkes relates several cases, in which the brain was extensively softened in consequence of the plugging of the cerebral arteries by clots of fibrin, apparently detached from the surface of the cardiac valves, where they had been formed. But we can readily conceive of softening as the result of a depraved nutrition, which in its turn may be owing to defects in the blood; and the phenomenon has been observed especially in anemic persons. From researches of Mr. Paget and others, there is reason to believe that this non-inflammatory softening may sometimes be the result of fatty degeneration, or at least that the two conditions are coincident. Infiltration with serum produces also a softening of the brain, without inflammation, as in sub-arachnoid and ventricular effusion.

The microscope affords the means of distinguishing, after death, the inflammatory from the non-inflammatory softening. In the former, numerous granules and granular corpuscles, resulting from the exudation of the inflammatory process, may always be detected, while they are absent in the latter. Professor Bennett, of Edinburgh, in all cases of softening examined by himself, in which the symptoms of cerebritis existed during life, found the evidences just referred to after death; while in the cases of softening which exhibited none of these granules or granular corpuscles, the symptoms of inflammation had not been noticed. (*Ed. Month. Journ. of Med. Sci.*, April, 1851, p. 365.) It is, however, at present asserted by some pathologists, that granular corpuscles are found among disintegrating or degenerated tissues, where no antecedent inflammation whatever has existed.

Softening of the brain has been investigated with great assiduity by pathological anatomists, among whom Rostan is most conspicuous, though much is due also to the observations of Abercrombie, Andral, and many others of a more recent date. But the attempt to make of it a distinct affection, marked by certain characteristic phenomena during life, to elevate it, in other words, into the rank of a distinct disease, has not been successful. It would appear to me as reasonable to make distinct diseases out of softening of the lungs, the stomach, and the heart. This condition is not itself a disease, but merely the result of morbid processes.

It is true that, in the brain, it is often attended with a certain train of phenomena during life, which indicate its existence with some degree of probability. Such especially is the rigid contraction of the flexor muscles of the limbs, associated with or followed by paralysis. But softening sometimes exists without producing these symptoms, and the symptoms have been found to proceed from other causes; so that there is no necessary connection between them. The fact appears simply to be, that, in the progress of inflammation of the cerebral tissue, there is a point at which, before its destruction, it is capable of expressing its irritation by a tonic involuntary contraction of certain muscles; while, after its complete disintegration, all its power is lost, and complete palsy of the muscles results.

Instead of softening, *induration* of the cerebral structure is sometimes found, as a consequence probably of chronic inflammation. In certain cases, the affected part is more than usually injected and vascular; and its consistence has been compared to that produced by immersing the brain in dilute nitric acid; in others, it is of a pearly whiteness, with less blood than in health and as hard nearly as wax. It has been noticed that, though convulsive movements attend this species of lesion, paralysis is less common than in softening; owing undoubtedly to a less complete disorganization of the cerebral tissue.

True gangrene is sometimes observed in the brain as a result of inflammation. It may occur on the circumference, or in the interior of the cerebral substance. It is marked by a livid appearance and softening of the tissue, a fetid odour, and the presence of a greenish, sanious, very offensive liquid. Ulcers have also occasionally been noticed on the cerebral surfaces.

It would seem rational to expect, as each muscle, and each organ of sense probably has a nervous centre which presides over its function, and nervous cords connecting it with that centre, that the particular seat of a cerebral lesion found after death, taken in connection with the external part of the function affected during life, might afford us the means of tracing the relation between the centres and their several dependent structures and functions, with some degree of precision; so that, by observing the muscle or organ of sense diseased, or the mode of its disease, we might fix upon the morbid point in the nervous tissue. But experience has not yet confirmed such anticipations. "We possess," says Calmeil, "examples of circumscribed softening of one of the corpora striata, one of the optic thalami, the anterior lobe, the middle lobe, the posterior lobe, a deep point in the white substance, a cerebral convolution, a whole hemisphere; in each of these cases, it would have been impossible to assign before death the special seat of the softening. Nothing in the pronunciation, in the derangement of movement in the arm or the leg; nothing in the state of the intellectual functions, permits a suspicion as to the limits of the softened part. The local softening of the cerebellum gives rise to the same symptoms nearly as softening of the brain; nevertheless, the persistence of pain in the back of the head, the absence of delirium or disturbance of the principal intellectual functions, the occurrence of erection, a tumultuous state of the movements preceding paralysis, as well as the trouble of vision, might give cause to fear the formation of cerebellic softening." (*Dict. de Méd.*, xxvii. p. 213.) Mr. Paget has related a case in which a tendency to fall forward upon the face was observed, and in which the disease was found, after death, to have been seated in the crura of the brain. (*Med. Times and Gaz.*, Feb. 1855, p. 178.) The same tendency, however, to fall forward has been noticed in cases of disease of the corpus striatum and pons varolii. (*Ibid*, March, 1857, p. 219.)*

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* The statement in the text, as to the impossibility from the symptoms of determining the precise position of local cerebritis or softening, was quite true when this work was first printed, about twenty years ago, and still continues to be so to a very considerable extent. But experiments and observations since that period have been very numerous in this direction; and, though much less fruitful than could have been desired, have not been altogether without beneficial result. In some instances we are enabled, through discoveries thus made, to indicate the locality of the disease with great probability, if

Causes.—The causes of local inflammation of the brain are essentially the same as those of meningitis. It is also not unfrequently produced by solid

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not with some degree of certainty; and, even where nothing positive has been reached, a path has been opened into the intricacies of the subject, and glimpses given, which may lead to something more satisfactory in the future. Instead of incorporating what I have to say on this point in the text, I prefer introducing the new matter in the form of a note; as much of what is to be stated must, in the present state of our knowledge, be looked on as provisional. It is in reference to the cerebellum and positions at the base of the brain, mainly, that new light has been obtained; the precise localization of inflammation in other portions of the cerebrum being now as undetermined, or nearly so, as ever. The remarks which follow will apply to other morbid conditions of the cerebral substance, as well as to inflammation and its consequences, such as the different kinds of tumours, degenerations, apoplexy, &c.; the indications which tend to fix the precise locality of these affections being essentially the same.

Diagnosis of Disease of the Cerebellum. The experiments of Flourens in relation to the cerebellum are familiar to all physiologists. By slicing portion after portion of this structure in pigeons as well as in animals belonging to the mammalia, he found them gradually to lose the power of flying, walking, or even standing, in fine of making any movement requiring co-ordination of muscular action. These experiments have been so often repeated, with the same result, that there can no longer be doubt of their entire accuracy. In other experiments, in which not the gray substance of the cerebellum itself, but the efferent fibres of its peduncles, which carry its influence to the proper destination, were injured, phenomena of a singular character were induced; such as rotation of the animal on its own axis when standing, or rolling when in the horizontal position, or various derangement of locomotion, as moving circularly, or in a straight direction to the right, or left, or backward. From these results, it was inferred, that the peculiar function of the cerebellum was to preside over or regulate the co-ordination or association of movements, though not itself the generator of motion. But similar results having followed wounds or injuries in other portions of the encephalon, and extensive disease of the cerebellum having occurred in which these phenomena were not observed, this opinion as to its peculiar function has been thrown into considerable discredit; and one consideration, very much opposed to it in my mind, has always been, that it necessarily implies the exercise in some degree of intellectual function on the part of the cerebellum; as, without this, it is impossible to conceive of the combination of motions for certain purposes, under the action of the will.

Not more certainty exists in regard to the influence which the cerebellum has been supposed to exercise over the generative system; and, indeed, the facts upon which this opinion was based have been met with so many of an opposite tendency, that it is at present but feebly entertained in any practical relation.

But are we, therefore, wholly in the dark in relation to the cerebellic functions? and are there no means of diagnosticating its diseases as distinct from those of the cerebrum? Some researches have within a year been made in France and elsewhere, which tend to throw light upon this subject; and, with their aid, I am disposed to think that we may give an encouraging, if not altogether satisfactory, answer to those questions. I would refer the reader especially to two essays, one by MM. Leven and Ollivier, and the other by Dr. J. Luys, the former of which appeared in the *Archives Générales* for November, 1862, and the other in the same journal for October, 1864, and subsequent numbers.

The cerebellum, without sensibility itself, has no connection with the intellectual or sensorial influences of the brain. Its great, perhaps its only function, is that of presiding over the muscular property of motility; certainly, I think, in reference to the voluntary muscles, and, perhaps, in some degree, the involuntary; though, in relation to the latter, the fact has not been proved. Its office seems to be not to originate motion, but to keep the muscles in a state in which they will answer to the stimulus of any direct motor power, as, for example, that of the will. Its action is constant, unless interrupted by some abnormal condition; and hence the muscles, when properly influenced by it, are always ready to operate if duly stimulated. It may be said that the muscles, even though their connection with it may be broken, are still capable of contracting under the will; but they do so feebly, and perhaps in consequence of a certain degree of inherent power which they may possess independently of the cerebellum, but which requires to be constantly recruited from this centre, in order to be duly maintained.

In correspondence with this view, when the power of the cerebellum is impaired by wounds or other causes, there is a defective and unequal supply of necessary influence to the muscles, in consequence of which, they act feebly, and one more feebly than another, so that, when the will or other motor impulse operates on them, there is altogether defective, yet at the same time unequal action; and properly associated movements canoodies in the brain, as carcinomatous, and fibrous or fibro-cartilaginous tumours, scrofulous tubercles, hydatids, and collections of effused blood. It is even more apt than diffused meningitis to result from local injuries.

not be made. This is probably the whole secret of the supposed co-ordinating power of the cerebellum. The muscles are not prevented from contracting efficiently for any given purpose, as for flying, walking, standing, &c., because the cerebellum does not properly combine their action; but because, being defectively and unequally supplied with the requisite power, they do not answer in due time and degree to the motor influence; and hence fail to perform their several parts properly in any associated movement.

But how account, on this principle, for those other phenomena, the rotary and irregular locomotions executed when the efferent fibres of the cerebellum are wounded? These motions are probably in general involuntary, being merely reflex actions resulting from the irritation of the wound extended to the cerebral or spinal centres of motion. The tendency to whirl round on an axis, to move in circles, or to follow irresistibly certain lines of deviation to the right, left, &c., may be explained by the consideration that, the connecting cords being cut on one side, capacity of motion ceases or is diminished on that side, while the other, retaining its nerve power, obeys the reflex motor impulse energetically, and hence gives these various directions to the body generally.

Having premised these physiological views, we are prepared to enter into a pathological consideration of the subject. In what way may diseases of the cerebellum be diagnosticated from those of the cerebrum? In local inflammation, abscess, apoplexy, tumours, or injury of the cerebellum, there are certain symptoms which it shares equally with the cerebrum similarly affected, and others more or less peculiar to itself.

In relation to the diagnosis of diseases of the cerebellum, it should be understood that it is in the early stage that the symptoms are most characteristic; as, in the advanced period, its peculiar signs become almost always mingled more or less with those which belong to the cerebral affections. The following symptoms occurred in 76 cases of cerebellic disease collated by MM. Leven and Ollivier;—intelligence and sensibility (except as regards sight) unaffected in all; general muscular weakness in 17; difficulty or impossibility of standing in 13; difficult walking in 9; inclination of head on the trunk, or body curved, in 18; gyratory movements in 3; irresistible direction to one side in 6; hemiplegia complete or incomplete in 8; convulsive movements in 24; rigidity of muscles in 2; difficulty of speech in 13; facial palsy in 2; headache in 41, of which 31 were occipital; vomiting in 22; affections of the eyes, including strabismus, dilated and contracted pupil, amblyopia, amaurosis, and opacity of the cornea, one or another, in nearly all.

The most characteristic symptoms are those implying weakness of the locomotor faculty. The patient has a tottering gait, often stumbles or falls, cannot stand erect, and in his movements resembles closely a person intoxicated with alcohol. Occasionally he deviates from his intended course either to the right or left, or even moves backward. He may become so weak as to be unable to rise from his bed; but the muscular power is seldom if ever quite lost. The muscles will almost always exhibit some effort to obey the will when this is energetically exerted. Sometimes hemiplegia occurs, generally on the side opposite to the lesion, and occasionally also paraplegia, or local palsy, as of the face, of a single limb, &c. But, when the cerebellic is not complicated with cerebral disease, the palsy of motion is seldom if ever quite complete, while the sensibility remains unaffected. This is, indeed, a general character of simple disease of the cerebellum, that sensibility and intelligence are undisturbed, except in relation to sight.

This weakness extends also to the muscles of the eye, both intrinsic and extrinsic, leading to the same irregular action, and want of proper association. Hence strabismus is frequent; in some rare cases the eyeballs rotate; there is occasionally a defect of the power of accommodation; and dilatation or contraction of the pupil is not uncommon. Probably in connection, in some measure, with this irregular muscular action, especially within the ball, may be a gradually increasing weakness or disorder of vision, which often occurs, and which sometimes increases from moderate amblyopia to perfect amaurosis. This last effect can be ascribed only to some morbid influence extended to the corpora quadrigemina or centre of vision, either by sympathetic irritation or compression. It certainly cannot be ascribed to simple deficiency of muscular power or action. Perhaps to a similar cause may be ascribed the partial deafness which is said sometimes, though rarely, to complicate the disease.

Difficulty of speech is another occasional effect of the deficiency of muscular power. At first the patient speaks more slowly than usual, then hesitates or stutters, and at length loses the power altogether, though without the least diminution of intelligence.

With other motor disorders there are not unfrequently spasmodic actions of different kinds; the convulsive, the tonic, or clonic, and sometimes tetanic shocks or rigidity; or movements resembling chorea take place; but all these may be referred to irritation sympathetically extended to the nervous centres, and thence reflected to the muscles.

Diagnosis.—This affection may be confounded with tuberculous meningitis, apoplexy, and certain cases of hysteria, to the account of each of which the reader is referred for the diagnostic symptoms. From meningitis, as

Headache is one of the most constant symptoms, and is often very severe. When seated, as it generally is, in the occiput, it may be regarded as a diagnostic sign; but, as pain in this position is not uncommon in cerebral disease, and as, in that of the cerebellum, it is sometimes seated in the forehead, vertex, or lateral portions of the head, or may be general over the head, it cannot be depended on alone. Connected, however, with some slight evidence of muscular deficiency, and weakness of vision, it is occasionally the only evidence of the affection in its early stage.

Vomiting is very frequent; but it is so common in various cerebral diseases that it is valueless as a diagnostic symptom.

The coma which sometimes comes on in the advanced stages is a sure evidence that the brain has become involved.

On the whole, perhaps the most reliable diagnostic characters are the general weakness and want of harmony in the muscular actions, the occipital headache with disorder of the visual organs, slight spasmodic movements; and all these without any disturbance of the intelligence or general sensibility.

Diagnosis of Disease at the Base of the Brain. As the mental functions, emotional as well as intellectual, probably reside in the gray matter of the cerebral lobes, they are always more or less involved in extensive disease of this portion of the encephalon; but the parts situated at the base of the brain, not being connected with these functions, might be supposed to be diseased without manifestation of mental disturbance. Were this really so, the general diagnosis of affections of this part would not be difficult; but the fact is, that the basic organs, when diseased, very often extend a sympathetic irritation to the upper nervous centres, and thus give rise to derangement of the mental manifestations. At the same time, from their position, they are necessarily concerned in the connection of the brain with the extracranial parts of the body, and consequently, when diseased, frequently interrupt in a greater or less degree this communication. Hence, sensation and the operation of the will are frequently interfered with, and palsy of one or both of these functions takes place. It not unfrequently, however, happens that disease at the base of the brain, though apt, as before stated, to disturb sympathetically the lobar functions, is unattended with this result, while it may prevent or alter the manifestations of these functions in the body generally; and, in such cases, we have a means of diagnosis. Thus, if a cerebral affection produces palsy, or convulsive movements, with an entire absence of all intellectual or emotional disturbance, we may conclude that this affection is probably seated in some one or more of the basic structures; and it sometimes happens that the precise part may be pointed out by certain peculiar symptoms. The intracranial nerves, distributed to the different organs, whether of sense or motion, either originate in or are given off by one or another of these structures; and the motor or sensational phenomena in the several organs to which the nerves are sent, not unfrequently point to disease in the particular structure whence the nerves respectively proceed. In this way, some progress has been made in the diagnosis of disease in the several structures at the base of the brain; and, now that this field of inquiry has been fairly entered, we may hope for much better knowledge in the future. I shall content myself with pointing to a few of the cases in which some positive light seems to have been obtained.

Tubercula quadrigemina. These are believed to be the visual centre. If, therefore, the sight is in no degree impaired, it is impossible that these bodies should be the seat of a serious disease. But in disturbed vision without disorder of intelligence, attended with epileptiform convulsions showing its intracranial origin, it is reasonable to refer the phenomena to disease either of these bodies, or of the anterior and upper part of the cerebellum, bearing directly on them. (Griesinger, *Arch. Gén.*, Juin, 1860, p. 687.)

Medulla oblongata. In motor paralysis of both sides of the body, having its origin in the encephalon, the seat of the lesion is probably on the side of the medulla oblongata, at the level of the decussation of the anterior pyramids. Supposing it to be on the right side, the motor fibres are struck by the lesion before they have passed to the left, and the left after they have reached the right side. (Brown-Séquard, *Dublin Quarterly*, May, 1865, p. 421.)

Pons Varolii. Annular Protuberance. Suppose a paralysis both of sense and motion in the left side of the body, and motor and sensory paralysis of the face on the right side, with paralysis of the external rectus of the eye on same side no palsy of the tongue nor impediment of speech existing, though the taste may be altered on the right. This cannot proceed from a cerebral lesion; as in that case the palsy of the body generally and of the face would be on the same side. Here is a case of injury or disease of the lower part of the *pons varolii*, paralyzing the cerebral nerves proceeding downward, while at the same time it affects the trigeminal and facial nerves, as well as the sixth nerve, before already described, the disease is distinguished by a very uncertain line. There are instances in which the diagnosis is not difficult. Thus, in a case attended with decided fever, frequent pulse, headache, delirium, general convulsions, and ultimately coma, without rigid spasm or local paralysis, we might be safe in ascribing the symptoms to meningitis; while we should be equally safe in considering as cerebritis an affection, in which, without frequency of pulse, acute delirium, or general convulsions, the prominent phenomena should be, in the beginning, severe headache and vomiting, at a more advanced period, tonic spasm in one or more limbs, with some degree of palsy, and, in the last stage, complete palsy. But very frequently the symptoms are so intermingled that a positive decision is impossible, and the physician must be guided by probabili-

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decussation. Should the lesion of the pons, however, be at the place of decussation, then along with the hemiplegia there would be facial palsy on both sides, with the other phenomena mentioned. Besides the above evidences of disease of the pons, is extreme coldness of the limbs which are to be the seat of paralysis, owing to a spasmodic contraction from irritation of the capillaries, before the loss of nerve power is complete. (*Ibid.*, p. 425-6.)

Suppose a case in which there may be paralysis of one side, with but moderate evidences of disease, followed, with an increase of the disease, by a disappearance of this paralysis, and the occurrence of hemiplegia on the other side. This may be explained by a lesion near the origin of the fifth pair, or the entrance of the auditory nerve, a small tumour for example, producing gentle pressure on the crus cerebri, and part of the pons varolii, or medulla oblongata. This causes reflex paralysis through the nerve centres: but, as the disease advances, and destroys the tissue before merely irritated, the reflex influence ceases; while, the nervous communication with the brain being cut off, palsy occurs on the opposite side. (*Ibid.*, p. 427.)

In a case of hemiplegia of one side, and palsy of the common oculo-motor, external oculo-motor, and facial or trigeminal, on the other, there is probably disease, say a *tumour without the cranium*, pressing on these nerves; and the fact will be rendered certain, if the electric contractility of the muscles receiving these nerves is weakened or suppressed. Tumours in the pons varolii may, by this test, be certainly distinguished from those without the cranium. In the former case, though there may be paralysis of these muscles, their electrical contractility is intact. (Griesinger, *Archiv der Heilkunde*, 1860, and *Arch. Gén.*, Juin, 1860, p. 688.)

A case is recorded in the *Archives Générales* (Avril, 1864, p. 488) in which an abscess of the size of a small nut was found in the thickness of the deep layers of the transverse fibres of the *pons*. The patient died speedily, without any palsy whatever in the extremities; the most prominent features of the case being facial paralysis, falling of the upper eyelid, and spasmodic contraction of the right masseter.

In the *Archives Générales* (Aug. 1865, p. 129) is an essay, by Dr. Ladame, of Neuchatel, on the subject of tumours in the *annular protuberance* (pons varolii), in which, from a comparison of 26 cases, he gives the following as the diagnostic characters of tumours here in relation to those elsewhere in the brain; "alternate hemiplegia, and in general paralysis accompanied with troubles of sensibility in a third of the cases; the multiplicity of the lesions of the organs of sense; and the frequency of the disturbance of intelligence. To these may be added lesions of speech, and difficulty of deglutition As a negative symptom, it is necessary, above all, to mark the absence of convulsions" It will be seen from this, compared with what goes before, how unsettled is yet our diagnosis of the locality of cerebral disease.

Crus Cerebri. A case has been reported by Dr. Hermann Weber, in which paralysis both of sense and motion of the *right* side of the body (face, trunk, and limbs), with increased temperature of the parts, was associated with paralysis of the muscles of the *left* eye supplied by the third nerve, and dilatation of the left pupil, with only slight disturbance of vision, and in all other respects an unimpaired condition of the special senses and intellect. Here paralysis of the right side implied disease in the left side of the encephalon; the immunity of the mental faculties and special senses indicated that the disease was at the base of the brain; and the palsy of the muscles supplied by the third pair pointed out as its precise seat the crus cerebri. The diagnosis was confirmed after death. Hemorrhage was found occupying a small space in the interior of the left *crus cerebri*, in immediate contact with the third nerve. (*Med. T. and Gaz.*, May, 1863, p. 553.)

The above have been given merely as examples of the progress which has been made in the diagnosis of local cerebral diseases, without any pretension to have exhausted the subject. It cannot, however, be said that we have yet arrived at sufficient positive knowledge on the points under consideration, to justify even an attempt to give a complete and reliable diagnosis of the intracranial diseases. (*Note to the sixth edition.*)

ties alone in forming his opinion. One of the marked differences between the two affections is the more frequently protracted duration of cerebritis.

Prognosis.—This is always a dangerous disease. Traumatic cerebritis is less so than that which arises spontaneously, probably on account of the predisposition which has favoured the production of the latter, and continues to operate in sustaining it. I have no doubt, however, that local inflammation of the brain, though arising without violence, may generally be cured by efficient remedies employed in the early stage. After the appearance of the tonic contractions of the limbs, the chances are diminished, and still more so after complete local paralysis. Still, if the portion of brain disorganized be not very extensive, there may be some hope for the patient. There is the chance that the softened part, supposing this to be the true state of the lesion, may be converted into an abscess, that this may be enclosed in a cyst, and thus, being in some measure cut off from the system, may cease to occasion serious symptoms, and may even in time undergo absorption.

Treatment.—This does not differ materially from that directed for meningitis; and it is wholly unnecessary to go again into a detailed account of the remedies. As a general rule, cerebritis does not admit of so copious a depletion as the former disease; because the actions of the system are already considerably depressed by the want of the due supply of nervous power, and there may be some danger, by very ample bleeding, of depressing them below the point necessary for the support of life. Nevertheless, in the acute cases, and before decided evidences of softening have been offered, bleeding should be carried to whatever extent the patient can bear; and the practitioner, in judging of the quantity to be taken, must be influenced less by the pulse than by other signs. If the pulse were the sole guide, so little excited and so weak is it, in many instances, that stimulation rather than depletion might be deemed necessary. Should it be found that, during the flow of blood, the patient shows no signs of faintness or nausea, the operation may be continued till the usual quantity directed in inflammatory diseases has been taken; and, if no greater general prostration ensue, while the symptoms of the disease continue, the operation should be repeated until some decided impression is made.

In the more chronic cases, bleeding must be more sparingly employed, especially if the disease has advanced to the second stage; for in that case, as a long reparative process may be necessary, the strength of the system should be in some measure husbanded. Under these circumstances, after a single moderate bleeding, the practitioner should be content with local depletion from the temples, scalp, or back of the neck. From two to four or six ounces of blood may thus be taken every third or fourth day; to be increased or diminished according to the obvious strength of the patient. With this treatment moderate purgation should be combined every other day, or more active purgation at somewhat longer intervals, as may seem best to the judgment of the practitioner. A constant succession of blisters, three or four inches by six for an adult, should be kept upon the back of the neck, and between the shoulders; and means should be taken to direct the current of the circulation as much as possible from the brain. The blisters may in very chronic cases be superseded by a seton in the back of the neck, or issues between the scapulæ. While this treatment is going on, a moderate mercurial impression should be made, so as simply to touch the gums in the slightest degree; and this should be sustained for a long time.

The diet in this stage must be exclusively vegetable; the mind should be kept as tranquil as possible; and perfect rest should be enjoined. By this treatment, with the accessories which the judgment of the practitioner may suggest in relation to any existing disorder of function, the disease may often be controlled in the first stage, and a complete cure obtained.

The same plan should be continued in the second stage, but with a diminished activity of depletion. Should the patient be feeble, milk may be added to the articles of diet.

In the last stage, or that of palsy, little else remains for the practitioner than to guard the patient against injurious influences, and to give nature a fair chance for the work which she alone can accomplish. To guard against accessions of inflammation, a seton or issue may be kept open in the neck; and, should inflammatory symptoms occur, they should be obviated by a cautious use of the measures recommended in the early stage. Iodide of potassium may sometimes be found useful in promoting the absorption of effete matter, and favouring the nutritive process by which the healthy structure is to be restored.

The practitioner should endeavour to maintain all the functions as nearly as possible in their normal state, so as to avoid the transmission of irritations to the brain from these sources. Hence, he should watch over the stomach and bowels, liver, kidneys, and uterus. Should the patient be feeble, it may be necessary even to resort to tonics, and, in anemic cases, especially to the chalybeates. The diet, too, in this stage, should be improved, and the patient allowed the lighter kinds of animal food. It may even be proper, after the injury of the brain may be supposed to have been repaired, to use measures for directly stimulating the paralyzed parts, as nux vomica, electricity, and frictions; but the consideration of these remedies belongs to palsy.

III. TUBERCULOUS MENINGITIS.

Syn.—*Acute Hydrocephalus.*

THIS affection is characterized by inflammation of the membranes of the brain, and to a certain extent also of its substance, in connection with tubercles in the pia mater.

Under the name of hydrocephalus, two distinct diseases have until recently been confounded; one consisting essentially in an excessive collection of serous fluid within the cavity of the cranium, independently of acute inflammation, and constituting strictly a dropsical affection; the other a real phlegmasia of the brain and its membranes, often, it is true, attended with a copious effusion into the ventricles, but not unfrequently with little or none. The former of these affections has been treated of among the dropsies, the latter belongs to the present place. But the confusion in the use of the term hydrocephalus does not stop here. By referring to the writings of British authors, it will be seen that in general they draw no very clear distinction between simple and tuberculous meningitis; and that these affections, as they occur in children, are in some degree confounded in their accounts of acute hydrocephalus. But the two complaints are very different in their nature; one being a frequently curable disease, the other, in the present state of our knowledge, essentially incurable. Indefinitely as the term thus appears to be used, it is best to abandon altogether its application to the cerebral phlegmasiæ, and to limit its employment to its strict etymological meaning, as a synonyme of true dropsy in the brain. Such is the course pursued in this work. Of the two acute diseases above referred to, simple meningitis has been already considered; and it now remains to treat of tuberculous meningitis; undoubtedly the affection which, though until within a few years indefinitely known, has been mainly in the thoughts of writers when describing acute hydrocephalus.

The existence of tubercles in the substance of the brain has been long familiarly known to pathologists; and writers have for many years occasionally noticed granulations of the membranes, as one of the anatomical characters of hydrocephalus. It was also a common observation that the disease was frequently associated with the scrofulous diathesis. Both of these facts were familiar to M. Guersent, who adopted, in 1827, the name of *granular meningitis* to designate those cases of meningeal inflammation in which the granulations existed, and taught, besides, that hydrocephalic patients were consumptives dying through the brain. (*Dict. de Méd.*, xix. 394.) But neither to M. Guersent, nor to any other pathologist up to that time, does it appear to have occurred that the granulations might be tuberculous, and the true cause of the meningitis. M. Papavoine, in two cases published in 1830, demonstrated that such was the nature of these small bodies, and showed their concurrence with tubercles in other organs. (Barthez et Rilliet, *Traité des Malad. des Enfants*, iii. 550.) But it was only as a coincidence that they were thus proved to be present in cases of hydrocephalus. To our own countryman, Dr. Gerhard, and to M. Rufz, who conducted simultaneously in the years 1832 and 1833, in the Children's Hospital, at Paris, their investigations into the pathology of this disease, the credit certainly belongs of having first clearly shown its essential connection with, and dependence upon tubercles of the pia mater. (*Am. Journ. of Med. Sci.*, xiii. 313.) This discovery, though it has unhappily not led to any important therapeutical result, is in the highest degree interesting, and is so far satisfactory, as it has solved the mystery of the exceeding fatality of hydrocephalus, and given precision to the pathology of a complaint, in relation to which, previously, there was much vagueness and uncertainty. The conclusions of Drs. Gerhard and Rufz have been subsequently confirmed by numerous observers in relation to the disease as it occurs in children; and MM. Diberder and Valleix have established the same facts in cases of adults.

Tuberculous meningitis may occur at any period of life, from the earliest infancy to old age; but it is beyond all comparison most frequent in children, so that it is generally looked upon as a disease of childhood.

Symptoms, Course, &c.—The complaint may be considered as acute or chronic, according to the light in which it is viewed. It is probable that the tubercles are gradually developed, and often exist for a long time before the occurrence of inflammation; but, when this has been once excited, its march is usually rapid. In relation, therefore, to the tubercles, the disease may be chronic, while, in relation to the inflammation, it is acute.

In the greater number of cases, the active stage of the complaint, or that of clearly developed inflammation, is preceded for a variable length of time, sometimes for many months, by symptoms indicative of deranged health; and these symptoms are often such as depend upon the existence of tubercles in other parts of the body. The child is affected with a dry cough, occasional fever, emaciation, paleness, listlessness, and want of spirits, and various signs of disorder in the digestive organs, such as irregular appetite, diarrhœa, or constipation, and unhealthy discharges. Along with these there are also, in many cases, symptoms which belong to the affection of the brain. Occasional attacks of headache, with or without vomiting, are experienced, or the child exhibits other evidences of cerebral congestion. These spells occur usually at irregular intervals; but sometimes they come on at a certain time every day or every other day, with apparently good health between them, so as very much to resemble paroxysms of intermittent fever, for which they have occasionally been mistaken. These head affections may gradually deepen into the acuter form of the disease, so that it shall be impossible to decide when the latter precisely commences; but more frequently the inflammatory symptoms show themselves abruptly, and the transition from the comparatively latent state to that of excitement is obvious.

Not unfrequently, moreover, the acute attack comes on in the midst of apparently perfect health, without any warning whatever from preliminary disorder. In either case, it is marked with more or less of the following phenomena. There is in general a disposition in the disease to a certain succession of symptoms, which may be arranged into three successive stages, according to the example set by that close observer, Dr. Robert Whytt, who published, in 1768, the first very accurate description of the complaint. But it must be acknowledged that the distinction between these stages is not always well observed, and that they are frequently a good deal confused together.

The prominent symptoms of the *first stage* are headache, vomiting, and constipation, with more or less febrile excitement. Not unfrequently the child is seized with a paroxysm of vomiting and pain in the head, without apparent cause, which disappears and returns daily, or two or three times a day, for two, three, or four days successively, before he is taken off of his feet. In other instances, the acute attack begins with chilliness or rigors, followed by fever, together with the local symptoms mentioned. After the disease is completely formed, the *pain of the head* is almost constant, in some degree, and seldom leaves the patient so long as sensibility remains. It is, however, much more severe at certain times than others; and every now and then sudden and violent lancinating attacks of it seem to occur, extorting sharp, quick cries or screams from the patient, which are among the characteristic features of the disease. The seat of the pain is most frequently in the anterior part of the head, though it is sometimes referred to the temples or occiput. In very young children, it is exhibited, independently of their cries, by the frequent application of their hands to the head, or by pressing it against the breast of the mother. The *vomiting* is apt to occur simultaneously with the pains, or soon after them. Sometimes food only is discharged, but more frequently bile. This is always a suspicious symptom in children, when occurring repeatedly without apparent cause. It does not usually continue longer than four or five days, and sometimes ceases after the second or third. Occasionally, however, it lasts much longer, especially when the disease commences with isolated paroxysms of headache and vomiting.

Constipation is very common in the early stage, and sometimes yields with great difficulty even to active medicines. The stools, when obtained, are usually green or dark-coloured, and sometimes black. They are seldom quite healthy. Occasionally the patient experiences abdominal pains. The *pulse* is usually more or less excited, sometimes considerably so; and there is generally some febrile heat. The face, usually rather pale, exhibits at times remarkable flushes of redness which quickly disappear, and often coincide in their occurrence with the paroxysms of severe pain and vomiting. The *tongue* is moderately furred and quite moist. There is little or no thirst; and occasionally the patient exhibits even aversion for drinks. The *eyes* are painfully sensitive to light, so that they are usually kept forcibly closed, and the patient cries if attempts are made to open them. The pupils are in some instances contracted, in others dilated; and these conditions sometimes quickly alternate. The child often has a characteristic frown upon his brow, and an expression of pain, or vacancy, or as if he were stunned, upon his countenance. The character appears to have undergone a change, and the playful temper of childhood is replaced by peevishness, fretfulness, or irascibility, without obvious cause. He is seldom, however, delirious at this period, but, if old enough, sometimes shows sagacity by his answers. Not unfrequently several days thus elapse, before he is quite confined to the bed.

The *second stage* is characterized by the supervention of more decided nervous symptoms, and of diminished frequency with irregularity of the pulse. The period at which the change takes place is altogether uncertain. It may come on in a day or two, or be postponed for a week. The symptoms not unfrequently also mingle with those of the first stage, so that no distinction of stages can be made. The pulse gradually diminishes to 80, 70, or 60 in a minute; and Guersent states that he has known it to descend even to 48. At the same time it is rather full, and more or less irregular, being faster at one time than another, now large and then small, and almost always intermittent, either at fixed or uncertain intervals. The respiration also becomes irregular both as to the succession and length of inspirations, is occasionally broken by deep sighs or yawnings, and is in some instances so long interrupted as to suggest the fear that it may not return. It is slower than in the first stage. The heat of the skin diminishes, and the patient is often affected with partial or general sweats. The paroxysmal flushes of the face continue. A disposition to drowsiness or stupor comes on, during which the patient grinds his teeth, and, if roused, has a look of idiocy or intoxication, answers with difficulty questions that may be asked, and immediately relapses into sleep. In this state he often moans, and occasionally sends forth sharp cries, probably marking attacks of pain. Instead of stupor, he is sometimes affected with delirium, which in a few instances is wild and restless, but is generally calm, and attended with low mutterings. This seldom continues more than two or three days, and then gives way to coma. The eyes are closed or partially open, and the patient seems unable to command the movements of the lids, which only partially obey the will when he wishes to raise them. The pupils are usually dilated, in some instances equally, in others unequally, and are little sensible to light; vision is impaired or disordered; and strabismus often takes place, sometimes in a converging, and sometimes a diverging direction. The hearing is less affected than the sight. The tongue remains moist, the vomiting ceases, the constipation is less obstinate and yields to purgatives, and the abdomen is singularly retracted. There seems to be no disgust for food, and the patient swallows what is given him. This period often continues a week or ten days. In the course of it, a remarkable remission of almost all the symptoms occasionally takes place, giving to the inexperienced strong hopes of convalescence. There is sometimes, under these circumstances, no other sign of the disease remaining than irregularity of the pulse, and an unnatural expression of countenance. But the amelioration soon disappears, and the symptoms return with others still worse.

In the *third stage*, signs of a more profound cerebral lesion are presented. A disposition to tonic spasms is evinced in some part of the body. The flexors of one of the extremities, especially of the arm, contract somewhat rigidly, and attempts to straighten the limb are resisted, and appear to produce pain, the jaws are sometimes stiffly closed, the muscles of the back become rigid, and the head is occasionally drawn backward. Painful contraction of the cervical muscles is a very frequent symptom, and may often be noticed before the supervention of the last stage. The rigidity is in certain rare cases so extensive that the body seems as stiff as a board, and can be raised by the head and feet without bending. Along with these spastic contractions, there are occasional convulsive movements, more or less considerable. The patient is affected with subsultus, carphologia, and sometimes with a cataleptic state of the limbs. Partial palsy at length takes place in one or more of the extremities; the surface becomes insensible to the touch, and the eyes to light; hearing gives only vague evidences that it still exists; the patient sinks into profound coma; the pulse becomes regular, and more and more frequent, rising sometimes to 120, 140, or 160 in a minute, or even still higher, being at the same time very feeble; the face often assumes a violaceous hue, and is utterly expressionless; the eye is quite dim and as if covered by an opaque film; the surface becomes cold; involuntary evacuations take place; and the patient dies, often in convulsions.

But this is not the uniform course of the disease; and the symptoms enumerated occur sometimes with great irregularity. Thus, in some instances, the attack begins with delirium. In others, convulsions take place at an early period; but, according to Barthez and Rilliet, only in cases in which there are tubercles in the substance of the brain. Cases have occurred in which there was a total want of drowsiness until near the close. Others have exhibited coma at the commencement, and throughout the course of the disease. Instead of constipation at the beginning, there is sometimes diarrhœa, in consequence of complication with enteric inflammation. Occasionally the attack is made insidiously. The patient has some of the preliminary symptoms enumerated, but not such as to rouse the attention of his attendants to the danger, when all at once the acute symptoms come on with great violence. The approach of the disease is, in other instances, concealed by scarlatina, small-pox, or other febrile affection; and it is not suspected until it comes forth under full sail from the mist which had enveloped it.

The duration of the attack, counting from the first appearance of the vomiting and headache, is usually from one to three weeks; though death may take place in a shorter time, even so early as the third or fourth day, and may be postponed for six weeks or two months. The greatest number of patients probably die in the course of the third week.

Anatomical Characters.—The chief characteristic anatomical peculiarity of this disease is the existence of minute bodies, round or somewhat flattened, translucent or opaque, gray or whitish or yellow, from the size of a grain of sand to that of a pin's head, dispersed here and there over the surface of the brain and cerebellum, and situated beneath the arachnoid, in the substance of the pia mater. They are found upon all parts of the surface, the convex and lateral portions as well as the base, in the anfractuosities of the convolutions, and in the fissures. They may be on both sides of the brain, or only upon one side; and may be confined to a single spot, or may exist in several; and all this without any appreciable bearing upon the symptoms of the case. From a table of cases given by Barthez and Rilliet, it would appear that, contrary to what had been previously supposed, they are more frequent upon the convex surface of the brain than at the base. They are much more abundant upon the brain than the cerebellum. They are often isolated, but sometimes grouped in patches, and are apt to be arranged along the veins of the pia mater. In number they vary exceedingly. Sometimes not more than four or five of them can be detected, sometimes they are scattered in countless numbers through the pia mater. When the brain is exposed by the removal of the dura mater, they may be seen like yellowish specks through the transparent arachnoid, scarcely rising above the general surface. Sometimes, in order to see them distinctly, it is necessary to separate the membrane, and hold it up to the light. These bodies are altogether identical with the granulations found in other parts of the body, in tuberculous cases. In some instances, larger tubercles are found, from the size of a millet-seed to that of a filbert, and occasionally several miliary tubercles aggregated together, with portions of the pia mater included in the mass. In such cases, the number of the separate tubercles is always small.*

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* These tubercles have recently been very carefully examined by Dr. E. Rindfleisch, of Zurich, of whose very interesting statements (contained in the *B. & F. Medic.-chir. Rev.*, Oct. 1862, p. 527) the following is an abstract. A close relation exists between the miliary tubercle of the brain and the minute arteries. If the small vessels, running from the pia mater into the cerebral substance, be freed from the brain-matter, they will appear like so many threads, unequally studded with minute miliary nodules, apparently in different stages of their growth. These are generally gray and translucent; the larger sometimes only having a whitish opacity about the centre. They are connected with the outer coat of the artery, and are associated with it in their development. This coat is uniformly thickened for considerable distances from the formation of cells, which in certain circumscribed spots are so much increased as to form nodules visible to the naked eye, and constituting tubercles. When carefully examined with a microscope, the tubercle

The free surface of the arachnoid exhibits few signs of inflammation. The membrane has now and then an opalescent appearance in particular situations, and not unfrequently is somewhat viscid upon the surface. More rarely, it is in places thicker and firmer than in health, and capable of being removed along with the pia mater without tearing. Occasionally there is a little serum in its cavity, but very seldom either coagulable lymph or pus.

The pia mater almost always exhibits marks of inflammation, being injected, thickened, and infiltrated with a serous, gelatinous, or turbid liquid, but very rarely with fluid pus. Very often a concrete yellowish matter is seen deposited in its tissue, sometimes soft and inelastic, sometimes firmer, elastic, and somewhat shining, and supposed to consist of concrete pus, or coagulable lymph. This yellowish matter is either in patches, or deposited in lines bordering the blood-vessels; and is much more commonly seen at the base of the brain than upon its summit; as is the case also with the other signs of inflammation in the membrane. Miliary tubercles are often interspersed in the midst of the gelatinous and yellowish deposit. The latter sometimes covers almost the whole base of the brain in a continuous layer. But there is no precise relation between the numbers of granulations and this product of inflammation; nor do they necessarily occupy the same portions of the surface. Sometimes the tubercles are seen with only a slight redness or infiltration around them, scarcely amounting to inflammation.

The brain itself exhibits morbid appearances. The convolutions are much flattened, and sometimes quite effaced, either by the cerebral turgescence, or the amount of fluid in the ventricles. The cortical portion is reddened, and sometimes softened in the vicinity of the inflamed patches. The medullary portion, when cut, appears often as if sanded over with red specks.

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is found to contain two kinds of cells. One of these is considerably larger than the other, with a smooth surface justifying the idea that they have a cell-wall, rounded or angular with rounded corners, filled with a finely granular substance, and furnished with one, or less frequently with two, three, or four rather small, round, brilliant nuclei, generally eccentric. The greater bulk of the tubercle consists of this kind of cell, which, the reader will perceive, bears some resemblance to the tubercle-cell, as described by Lebert. When there is more than one nucleus, the others appear to have been derived from the division of the first. The second kiud of cell is much smaller, and is probably an endogenous product of the former kind, resulting from a division of the nucleus. They are so much smaller, that three or more of them may be contained in the mother-cell. They also differ greatly in character, having a relatively much larger nucleus, with little liquid intervening between it and the cell-wall; and this liquid is perfectly transparent and homogeneous, instead of copious and granular as in the larger kind. These cells are first generated in the centre of the tubercle, where the whitish, opaque spot is noticed, to which attention has before been called. They are probably a step in the degradation of the tubercle, which is afterwards completed by their resolution into granular fatty matter. All these stages may be seen in one of the older tubercles, of which the outer layer consists of the larger cells, the next of the smaller, and the centre of a cheesy substance consisting of granular matter.

As to the mode of their formation, Dr. Rindfleisch gives the following views. The outer coat of the artery in health, where it enters the brain, is a glossy, homogeneous structure, with flat nucleolated nuclei on its inner surface. Around these is a finely granular substance, the increase of which is the first step in the disease. The nuclei are propagated by division, and the new nuclei assume the character of those of the tubercle cell, while a cell-wall forms around them including a portion of the granular matter, and thus completes the formation of the characteristic corpuscle. To me, however, it appears that Dr. Rindfleisch has been led to this explanation by the necessities of the theory *omnis cellula e cellulâ*. I cannot but think that a more applicable explanation will be found in the exudation theory, which would teach that there is an elimination from the blood into the outer coat of the vessel of an imperfectly organizable lymph, which in its attempt at organization is converted into granular matter, nuclei, and cells. These, from the necessity of their condition, undergo degeneration, as described by Dr. Rindfleisch. There is no necessity whatever for bringing into play the few scattered flat nuclei, which in this, as in other membranes, are probably merely the remains of the cells out of which the membrane itself was formed. (*Note to the sixth edition.*)

The ventricles usually contain an abnormal quantity of serum, either perfectly colourless and limpid, or somewhat turbid, probably from the products of inflammation in the ventricular walls, as supposed by Abercrombie, or from the softened tissue of the brain itself, as suggested by Barthez and Rilliet. The amount of fluid varies from a few drachms to four, six, or eight ounces, and sometimes even exceeds the last-mentioned quantity. Occasionally, however, there is no increase whatever beyond the healthy amount of serosity; and yet the symptoms during life are not materially different, showing that the effusion is not an essential feature in the disease, which has, therefore, no claim to a place among the dropsies.

The medullary substance which bounds the ventricles is much softened, sometimes to the consistence of cream. This change is especially observable in the septum lucidum, and the fornix. It may be of moderate extent, or may involve the whole of the walls of the ventricles; and the amount of it bears no fixed relation to the quantity of fluid. Some writers, with Dr. Abercrombie, ascribe this softening to inflammation; others, taking into consideration the absence of all the other marks of this affection, consider it as resulting from the infiltration of the medullary substance by the effused serum, in which it undergoes a kind of solution. Abercrombie gives cases in which the same softening was observed without any effusion.

In almost all cases of tuberculous meningitis which have been examined, tubercles have been found in other parts of the body, as in the substance of the lungs, the bronchial glands, &c., showing that the cerebral disease is the result of a general tuberculous diathesis.

The mucous coat of the stomach is frequently in a softened state.

Causes.—This disease is often hereditary in the same sense as other tuberculous diseases; that is, the general diathesis or predisposition is derived from the parent, and circumstances afterward give it one or another direction. The meningitis can scarcely be said to be itself hereditary; as persons affected with it very seldom live to be parents. Nevertheless, children are certainly born not only with a general tuberculous diathesis, but also with a particular tendency to this disease; as proved by the fact, that in some families almost all the children die with it, one after the other, without any appreciable external cause, and solely in consequence of some peculiarity in their organization.

It is possible that the diathesis may be created after birth by the operation of those various causes which have been detailed under the head of tuberculosis, external scrofula, and phthisis, and which it is unnecessary to repeat here. But the probability is, that the predisposition is much less frequently created than in the case of consumptive patients, because the early age at which this form of meningitis comes on frequently precludes, to a very great extent, if not entirely, the operation of the predisposing causes.

Among the influences which give a special tendency of the tuberculous predisposition to display itself in the brain, the most powerful is that of age. What it is in early life that leads to this result is not so certain. Some have ascribed great influence to the process of dentition; but it appears from recent researches that, though the disease is frequent during the period of the second dentition, it is rare during the first, which is so much more frequently the source of other diseases. Some other agency must, therefore, be sought for, and none appears to be so probable as the greater activity of the brain at this period of life, when not only more ideas are received than at any other period, but the necessities of a very rapid physical development require and sustain a constant excitement of the nervous centres. The time of life in which the disease is most frequent, is said to be between the fifth and tenth year. It is not uncommon from the second to the fifth year. Before the second, and after the fifteenth year, it is comparatively rare.

Neither sex nor season appears to have any peculiar influence over the disease.

Numerous causes have been accused of exciting the disease, or calling the diathesis into action. It is probable that whatever irritates the brain may tend to this result. When the tuberculous predisposition exists, whatever over-excites the vessels of a part, and disposes to exudation, must endanger the elimination of tuberculous matter in that part. It is not surprising, therefore, that falls upon the head, or other local injury should have the effect of producing attacks of tuberculous meningitis. Perhaps too much stress may have been laid upon this cause, but I do not think its occasional efficiency can be denied. Other exciting causes are direct exposure to the sun's rays, violent emotions as of anger or fright, a premature or too powerful exercise of the brain in the processes of education, the disappearance of cutaneous eruptions, worms and other causes of irritation in the alimentary canal, various febrile diseases, and probably sometimes dentition, which, though it may not be sufficient to cause the disease before the predisposition to it is formed, is no doubt capable, in some instances, of acting as an exciting cause.

Nature.—Some doubt has been entertained whether the tubercles, in these cases, are the cause, or the result of the inflammation. When the consistence of some of these small bodies, which are hard and resistant to pressure, is considered, it seems improbable that they should have been very rapidly produced; and, as they have been found without any attendant inflammation, or any signs of its previous existence, it is clear that this process is not essential to their formation. The inference is not unfair, that they are sometimes at least the result of a slow, and probably uninflammatory deposition, and that, after attaining a certain degree of development, they may either directly excite meningitis, or may keep the membranes in a state of irritation, which may be excited into inflammation, by slight accidental causes. But, at the same time, it is in the highest degree probable that an irritation or inflammation in the brain of a child, predisposed to this disease, may occasion the deposition of tuberculous matter; and that thus a scrofulous predisposition, without the present existence of tubercles in the meninges, may give a fatal character to accidental inflammation.

It appears that, in many cases, there is a peculiar yellowish deposition, like concrete pus, within the meshes of the pia mater, which differs from the results of ordinary inflammation, observed in cases in which there are no tubercles in other parts of the body, and consequently no proofs of a scrofulous diathesis. The differences between this deposition and that which attends inflammation in persons without tuberculous tendency, as pointed out by Barthez and Rilliet, are, that the former is almost always solid, the latter almost always liquid; the former occurs more especially at the base of the brain, the latter upon the convex surface; the former is of limited extent, the latter may spread over the greater portion of the surface of the brain; and, finally, the former attacks almost exclusively the pia mater, while the latter occurs habitually in the great cavity of the arachnoid. (*Trait. des Malad. des Enfants*, iii. 487.) This matter may be associated with tubercles in the pia mater, or may be wholly independent of them. When tubercles exist in this membrane, the deposition may occupy the same parts as the tubercles, or may be found in others. It is not, therefore, necessarily the direct result of the irritation of the tubercles; and must be ascribed to a peculiar influence exerted upon the nature and results of the inflammation by the scrofulous or tuberculous diathesis. It may possibly be the product of such an acute action of the vessels as, if chronic, might produce proper tuberculous matter.

It appears, then, that, though tubercles in the meninges are commonly present in tuberculous meningitis, and serve as the exciting cause of the inflammation, yet the scrofulous diathesis, as evinced by tuberculous deposition in other parts of the system, is capable of producing the same kind of inflammation of the membranes of the brain, without the existence of granulations, or other form of tubercle within the cranium.

Diagnosis.—The disease from which it is most difficult to distinguish the one under consideration is simple meningitis; and there can be little doubt that the two affections, as they occur in children, are very often confounded. Among the most certain criteria is the existence or non-existence of signs of scrofulous or tuberculous disease elsewhere. If the child has an obstinate cough, tumid abdomen with diarrhœa, or the marks of external scrofula, there is every reason to fear that the meningitis is tuberculous. In the absence of all such signs, the hope may be indulged that it will turn out to be simple. There are, however, points in which the two affections generally differ; though there may be individual cases which cannot be distinguished. In simple meningitis, the febrile excitement in the early stage is higher, with more heat and thirst, more delirium, and greater acuteness in all the symptoms. The vomiting is more frequent, the headache more continuous and less paroxysmal, and the patient is sooner compelled to take to his bed. The march of the disease is more rapid, the agitation and wildness in the course of it are more striking, and comatose symptoms appear more quickly. Simple meningitis often terminates in less than a week; the tuberculous generally continues till the close of the second, or some time in the third week. The time of life should also be taken into account. Tuberculous meningitis seldom occurs before the end of the second year; the simple inflammation often.

The various febrile diseases may for a time, in certain stages, be mistaken for tuberculous meningitis, especially enteric or typhoid fever; but the mistake cannot be of long duration. A careful study of the characteristic symptoms of each disease will guard against a continuance of the error. The irritability of the patient in the early stage; the violent and paroxysmal pains in the head; the vomiting without obvious cause; the sudden sharp screams; the pulse at first somewhat excited and afterward slow, intermittent, and irregular; the irregular respiration, with deep sighs and yawns; the constipation, dark-green or black discharges, and retracted abdomen; the dilated, contracted, or oscillating pupil; the strabismus; the tonic and clonic spasms; and the final partial palsy, will, in general, be sufficient to distinguish the meningeal affection. Occasionally almost all the peculiar symptoms of the disease are imitated by mere functional derangement, sympathetic with disease in the alimentary canal or elsewhere; and, in cases of this kind, dissection after death has revealed, to all appearance, a perfectly sound state of the encephalon. In such cases, however, there is generally some one characteristic wanting, either in the symptoms or the course of the disease, upon which a probable diagnosis may be founded. Thus, the patient may be affected with most of the prominent symptoms of tuberculous meningitis, but may want the characteristic condition of the pulse, somewhat excited at first and regular, then slow and intermittent, and finally rapid and again regular.

Prognosis.—This is almost always unfavourable. It is scarcely possible that recovery should take place with the pia mater loaded with irremovable tubercles. Dr. Whytt states that he never cured one of his patients. MM. Barthez and Rilliet never saw a case recover. M. Guersent, who witnessed a great multitude of cases, considers the disease as scarcely curable in any instance in the second stage, and quite incurable in the third. He is disposed to think that he has been successful in some cases in the first stage, but admits that the precise character of these is always doubtful. Very different accounts, however, are given by other practitioners of their success. Dr. Gölis, of Vienna, who had charge of an institution for children in that city, states that he has witnessed 41 recoveries. According to Dr. Odier, of Geneva, one-third of the cases of acute hydrocephalus in that city get well. Formey cured nearly all whom he had the opportunity to treat in the early stage. It is quite obvious that these statements have reference to different diseases. Many of the cases cured were undoubtedly either simple meningitis or mere imitative functional derangements of the brain. It is impossible otherwise to account for the different success of skilful practitioners, with plans of treatment not essentially different.

I have occasionally seen cases of cerebral disease recover, which appeared to me to present the characters of acute hydrocephalus, as this complaint was formerly defined; but I have never seen a well-marked case of tuberculous meningitis end favourably.

Still, the practitioner should not be discouraged, and should never intermit his efforts. There is always the hope, in the early stage, when the patient is not obviously tuberculous, that the disease may be simple meningitis, and consequently curable. There is the hope, too, that, even though the subject may be scrofulous, the tuberculous matter may not have been absolutely deposited in the brain, and the timely application of remedies may prevent the deposition. Even in the second or third stage, there is still the fact, that patients presenting the same symptoms have recovered; and the inference may be drawn, that possibly the diagnosis in the case under treatment may not be correct, and that the event may be equally fortunate.

Treatment.—It has been recommended by some writers to be sparing in the use of depletory remedies in tuberculous meningitis; as it is well understood that whatever lowers the grade of vital power, and deteriorates the blood, favours the deposition of tubercle. This is undoubtedly true as a general fact; but the inference is not, I think, just, in relation to this particular disease. It is admitted that, if tubercles are already formed in the membranes of the brain, sufficient to induce the symptoms of acute meningitis, there is scarcely any ground for hope. The disease, it is thought, must almost inevitably prove fatal. The most that can be expected is to protract life a short time, and with it the sufferings of the patient. Now, this is scarcely desirable; and even this little will fail to be gained in the vast majority of cases. Abstinence from active measures has, therefore, little to recommend it. But, if the practitioner shall have made a wrong diagnosis, or if the case be one of those in which tubercles are not yet formed, but only in danger of being formed should the inflammation continue, it is obvious that the expectant plan surrenders a case as hopeless, in which great good may possibly accrue from energetic measures. The inference from this is, that active treatment can do little or no harm, even if unsuccessful, while it may possibly be the means of rescuing the patient. It appears, then, to be the duty of the physician to treat such cases with all the energy which the strength of the system will permit.

Whatever danger there may be arises, in nearly all instances, immediately from the inflammation; for, even where tubercles are present, it is through this process that they almost always work out their fatal results; and, where they are not yet formed, it is this which most strongly disposes to their deposition. It is inflammation, therefore, that is to be combated. The treatment recommended for simple meningitis is exactly that required, upon the principles above stated, for the tuberculous variety. It is even more important in the latter, that the remedial measures should be early applied; for it is in the first stage especially that there may be some reason to hope that the tuberculous deposition may be prevented. To give the treatment in detail in this place would be mere repetition. The reader is therefore referred to the article upon simple meningitis. General and local bleeding, active purgation with calomel and suitable adjuvants, cold to the head, revulsion by means of blisters over the scalp, and the introduction of mercury into the system both internally and through inunction, so as to produce its constitutional impression, are the remedies to be employed. Depletion should be pushed to whatever extent the strength of the patient will permit. No precise directions can be given adapted to each case. As a general rule, this variety of meningitis does not bear bleeding so well as the simple; and, therefore, less blood must be taken. Calomel, however, as a purge, may be employed, in the cases of children, almost indefinitely. Enormous quantities have sometimes been given with impunity, and even with asserted benefit. But all that can be effected by these quantities can be gained from more moderate doses, as a great proportion of what is given lies inert in the bowels. From four to ten grains may be given at first to a child of two years or upwards, and, if it do not operate too actively, may be followed by the same quantity daily until the period for depletion is passed. After this time, it may be continued in smaller doses, frequently repeated, from one-quarter of a grain to a grain, for example, every hour, with a view to affect the system; while mercurial ointment is rubbed upon the insides of the limbs, and applied to a blistered surface over the scalp. When an impression is made upon the mouth, the mercurial should be suspended. Instead of blisters to the scalp, and at the same period of the disease, antimonial pustulation has been strongly recommended; and Dr. Hahn, of Aix-la-Chapelle, records several cases in which the remedy has proved effectual, though it sometimes induces disagreeable ulceration and even sloughing in the infantile scalp, which may last long, and leave indelible traces behind them. He recommends to pustulate a surface of five or six inches in diameter, avoiding with great care the fontanels. The tartar emetic ointment is to be rubbed for about ten minutes on the scalp previously shaved, and the application repeated every two hours until the surface becomes decidedly affected. (*Archives Gén.*, *4e sér.*, xx. 411, and xxi. 58.)

One additional remedy should be employed in this form of meningitis, from its supposed influence over the scrofulous habit of body, and in the hope that, if it do not promote the absorption of the tuberculous matter, it may possibly prevent its deposition. I allude to iodine. I would commence with it in such doses as the stomach of the child could bear, and continue it throughout the treatment. Iodide of potassium, or the compound solution of iodine (U. S. Ph.), should be employed.* Iodide of mercury might, with great propriety, be substituted for the calomel at the stage at which it is desirable to aim at the mercurial impression; and, in this case, the other preparations of iodine should be abandoned. Bromide of potassium is also suggested as a remedy by its supposed depressing action on the brain, and has been used with apparent benefit.†

In the last stage, when the strength of the patient declines, it should be supported by mild stimulating measures and nutritious food, upon the ground that, should the disease be of a less serious character than it seems, life might not be lost from sheer prostration. Instances have occurred of recovery under apparently quite desperate circumstances. There can be little doubt that, in these cases, the nature of the disease was mistaken; but the most skilful are liable to similar errors, and the patient should not be allowed to lose the benefit of this chance.

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* Since the statements in the text, reports of the most positive character have been made of the efficiency of iodide of potassium in tuberculous meningitis. Dr. Bourrousse de Lafore records eight cases in which it had been used successfully. Its effects were greater according as the stage in which it was given was earlier. He gave it in large doses. (*B. & F. Medico-chir. Rev.*, Jan. 1862, p. 236, from *Bulletin de Thérap.*)

† A case is related by M. Bazin, in which a young man of 19, who presented all the phenomena of tuberculous meningitis, with other morbid affections, was very much relieved of the former disease by the use of bromide of potassium, given at first in the quantity of 15 grains daily, and afterwards gradually increased to 30, 45, and at length 60 grains in the same period. But, though the cerebral symptoms disappeared, tubercles in the lungs and bowels were augmented, and no expectation of a cure seems to have been entertained. (*B. & F. Medico-chir. Rev.*, Jan. 1862, p. 236, from *Gaz. des Hôpitaux.*)—*Note to the sixth edition.*

Besides the remedies mentioned, many others have been employed, most of which, however, so far as regards any impression on the disease, are useless or worse than useless; and to repeat them would be unnecessarily to embarrass the student. A few merit, perhaps, a brief notice. *Digitalis* has been employed, in the early stage, in order to reduce excitement. I believe that it is useless for this purpose; but, combined with calomel or iodide of mercury, it may be given in the second stage, to promote the absorption of the effused fluid. Other diuretics have also been proposed, as *squill, colchicum, spirit of nitrous ether*, and *oil of turpentine;* but they are of little use. In the progress of the complaint, indications are often presented for the anodyne and composing influence of *opium*, or other *narcotics*. All these are obviously contraindicated, in the early stages, by the excitement existing in the brain. In the advanced periods, they may be used more safely, but always require caution. In cases which assume a somewhat chronic march, and especially when, with suspicious, but not certainly characterized cerebral symptoms, there are evidences of a scrofulous state of system, cod-liver oil should be employed. I have seen the most threatening symptoms disappear under the use of that remedy.

The functional or organic disorders, frequently occurring in the course of the disease, are to be combated by means which the general knowledge of the practitioner must suggest; reference being always had to the influence of such incidental measures upon the brain. Thus, vomiting is to be treated by small doses of effervescing draught, carbonic acid water, or lime-water and milk, internally, and by sinapisms, aromatic cataplasms, or other rubefacient applications, to the epigastrium; obstinate constipation, should it resist purgatives, by enemata of various kinds; diarrhœa, occurring in the advanced stages, or as a complication, by the cretaceous preparations, vegetable astringents, and acetate of lead, &c.; abdominal pains with tenderness on pressure, by leeches, emollient poultices, and blisters; and convulsions, independently of the remedies addressed directly to the disease, by the warm bath, garlic poultices to the feet, and frictions with garlic and brandy, oil of amber, oil of turpentine, &c. along the spine.

But prevention is of more importance in this affection than remedial treatment. When, from the previous death of one or more children in a family, there may be reason to apprehend that others may be predisposed to the disease, a plan of preventive treatment should be commenced at birth, and perseveringly maintained till the period of danger is passed. This plan must be directed to the counteraction of the tuberculous diathesis. The basis of it must be to maintain the general health in a vigorous state, but without excitement. Care should be especially directed to the formation of healthy blood. The child should receive its nourishment from a perfectly healthy nurse, in whom there can be no reason to suspect any scrofulous tendency. If the mother have not these requisites, she should surrender this part of her charge to another. After weaning, the child should be fed on a nutritious and easily digestible, but not a stimulating diet. Milk, farinaceous products, the more digestible fruits and vegetables, and meats in moderation may be used. Tea and coffee should be entirely forbidden. The child should not be shut up in close rooms, but exposed to the air, and encouraged to exercise himself out of doors, as soon as his age will permit; the precaution being always taken to keep him warmly clad, and to prevent the depressing effect of continued cold.

The brain should never be overtasked; and mental education, though not entirely neglected, should be postponed to the physical. Long sitting in close school rooms would be highly injurious. Care should be taken to obviate the ill effects of dentition. If eruptive affections appear about the ears, too much solicitude should not be evinced for their removal; and, if any suspicion exist of a disposition to internal scrofulous affections, attempts should be made by blisters behind the ears, or upon the arm, by pustulation with croton oil in convenient situations, by a seton in the back of the neck, or some similar measure, to give the disease an external direction. These measures may be aided by the moderate internal use of cod-liver oil and the preparations of iodine. Children with such predispositions are apt to be injudiciously indulged, and every caprice attended to by the fond and fearful parent, lest injury might result from the irritation produced by denial. No plan of treatment could possibly be worse. An excitable state of the brain is thus fostered and sustained, and the child, besides, made liable to constant injury from the violence of temper occasioned by accidental disappointment. The contrary course should be adopted. The child should be taught to control his temper, to be moderate in his desires, and to meet disappointments with equanimity.

Article II.

ORGANIC DISEASES OF THE BRAIN.

FOR the sake of brevity, this designation is here employed to express organic affections of the brain not dependent upon inflammation, effusion, or rupture of the vessels. Strictly speaking, inflammation and hemorrhage, and the results of an abnormal collection of fluid within the cranium are organic affections; but they are considered under other heads. This preliminary explanation is made in order to prevent misapprehension.

1. Non-inflammatory Softening of the Brain.—This is a not uncommon affection. It has already been referred to, in connection with inflammatory softening, under cerebritis; but its importance entitles it to a distinct consideration. Sometimes the whole brain is softened, as in cases of malignant febrile diseases, in which the blood is greatly depraved. I have seen the whole brain almost diffluent in a case of malignant scarlatina in an adult. But most frequently the affection is limited; and it is only in the latter condition that it is here to be considered. It may be seated in the brain or cerebellum, and in the gray or white matter. In the medullary portion it is of a white colour; and hence has been named *white softening*, to distinguish it from the softening of inflammation, which is either red from the presence of blood, or in various degrees yellow from pus. Its consistence varies from nearly that of healthy brain to the diffluence of cream, so that it may be washed away by a stream of water, or float off into the liquid which may abnormally collect in the ventricles. Under the microscope, it may exhibit signs of fatty degeneration of the blood-vessels; but none of the products of inflammation are discoverable, neither exudation or compound granular corpuscles, nor those of pus.

The symptoms are those of a failure of the cerebral functions, without any signs of excitement. General weakness, giddiness, uncertainty of gait in walking, and more or less intellectual feebleness, especially as regards the memory, are not unfrequent symptoms in the earlier stages. Tremulousness on attempt at motion, sometimes confined to a single limb, or greater in one limb than the others, is also not unfrequently observable. When these phenomena exist, with a pale face and feeble unexcited pulse, cerebral softening may be suspected. More decided symptoms, however, are sensations of numbness in some part of the body, and a gradual failure in the power of motion, which may be confined to one limb, one feature, or a single muscle, or may extend more or less to one-half of the body. This condition at length deepens into complete paralysis; and not unfrequently apoplexy takes place in consequence of the rupture of the enfeebled vessels, and the escape of blood into the substance of the brain. Palsy from this cause differs from that produced by cerebritis in the absence of those rigid contractions of the muscles so characteristic of inflammatory softening. A loss of sexual propensity, and an incapability of associating movement, might lead to the suspicion of softening of the cerebellum.

The causes of the softening may be general or local. An impaired state of the blood is the main condition through which the former causes operate. I have known an extremely anemic individual to be attacked with hemiplegia, which yielded to a tonic treatment, and which I believed to be dependent on softening of the brain. Intemperance probably acts partly in this way, and partly by over-excitation of the brain, followed by depression. The local causes are such as impede the access of blood to the parts of the brain affected, so that their nutrition cannot be duly supported. Of this kind are diseased conditions of the arteries at the base of the brain, and in general those which supply that organ with blood, especially the carotids. Organic affections of the coats inducing coagulation; arteritis producing the same effect, and sometimes causing obliteration of the vessel; fragments of morbid growths of the cardiac valves, of the decaying valves themselves, or of fibrinous coagula, carried with the current of the blood from the heart, or from an aneurismal tumour, to the cerebral vessels, and obstructing them; the narrowing of these vessels by the pressure of tumours, and the tying of the carotid, are causes of the kind referred to. Another cause of softening is supposed to be infiltration of the cerebral substance by serous liquid in the ventricles or the arachnoid cavity.[*]

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[*] Dr. Duparcque, of France, records cases of softening occurring in the brain in children, which, upon the closest examination, exhibited no appearance of inflammation after death, and the symptoms of which differed from those of any recognized variety of cerebral inflammation. The attacks occurred in children of precocious or highly cultivated intelligence, whose minds had been fatigued by intellectual labour, or subjected to profound or vivid emotions. The prominent symptoms were headache, vomiting, slight somnolency, trembling, integrity of the intellectual functions, and exaltation of special sensibility, without fever, increased frequency of pulse, convulsions, rigidity of the muscles, or paralysis. Death occurred rather suddenly, with general prostration, and slight convulsive movements. (*Arch. Gén.*, 4*e sér.*, xxviii. 168.) In the non-inflammatory softening produced by obstructed vessels, the most prominent symptom is ordinarily paralysis, with more or less headache and vertigo, and without the muscular rigidity which characterizes the lesion when dependent on inflammation.

Softening from Vascular Obstruction. The following are conclusions drawn by M. E. Lancereaux from a comparison of numerous observations upon this subject.

1. The two great causes of obstruction of the cerebral vessels are *thrombosis* and *embolia;* the former, when coagulation of blood takes place in the vessels in consequence of disease of their coats, or from other cause; the latter, when calcareous bodies, fragments of the valves, warty vegetations, and non-adherent fibrinous clots have been lodged in vessels themselves sound. The affection very probably exists when cerebral symptoms are associated with infarction of the viscera, or gangrene of a limb.

2. The effects of these two conditions may be such as arise directly from the obstruction of the vascular trunks, which are rare and temporary, and those from occlusion of the arterial branches, and the consequent softening of the nerve-substance.

3. The pathological process connected with obliteration of the arteries presents three stages, anatomically characterized by difference in the colour and consistence of the nerve-substance, which, in the *first*, is red and scarcely softened, in the *second*, yellow and pulpy, in the *third*, white and diffluent.

4. These are merely different phases of the same change, which consists in a retrograde metamorphosis of the part, previously nourished by the now obstructed vessels.

5. The symptoms are usually of a paralytic character; most frequently a sudden hemiplegia, with or without loss of consciousness. They bear a close resemblance to

Under the name of *atrophic cerebral softening*, attention has recently been called by Dr. Adolphe Gubler, of Paris, to a variety of softening of peculiar origin. It has been demonstrated by Dr. Waller, of London, that, when a nerve is divided, that portion of it undergoes decay which is in the contrary direction to its source of influence, while the other end, connected with the source, retains its normal state. Thus, cut a nerve of motion proceeding from a cerebral or spinal centre, and the peripheral part will perish; while, in a sensitive nerve, carrying impressions from the circumference, if similarly treated, the part next to the centre is that which suffers; the opposite portion in each case remaining unaffected. The same, according to M. Gubler, is the case with tracts of nervous matter within the encephalon. If a portion of the gray or white substance of the cerebral lobes be so far injured by inflammation, or other disease, as to completely incapacitate it for the performance of its functions, some part of the nervous tissue which conveys its influence to the exterior will be apt to undergo a retrograde metamorphosis, and become softened, because, its office having ceased, its nutrition ceases also, and it gradually perishes. Conversely, if any external part, which may have a portion of the brain mainly or exclusively devoted to it, should be completely cut off from its centre, this may in like manner suffer decay, because it has no longer any function to perform, and consequently ceases to be nourished. M. Gubler, in his essay on this subject, gives cases illustrative of both these results; but the observations are yet insufficient, both in number and character, to take his views out of the category of the hypothetical, though they are very plausible. (*Arch. Gén.* Juillet, 1859, p. 31.)

The treatment must consist of measures directed to the sources of the affection. In cases of general debility with impoverished blood, the obvious remedies are tonics, a nutritious diet, and the preservation of the various functions as nearly as possible in the normal state; and, among the tonics, the chalybeates are probably the most valuable. For the removal of the local causes, so far as they can be reached, the appropriate measures have already been mentioned under arteritis, coagula in the blood, &c. By a timely recognition of the disease, and the use of suitable means of cure, I have no doubt that many cases of cerebral softening may be arrested, and, where they cannot be

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those of apoplexy, but differ in their course, and the absence of muscular contractions and convulsions, such as characterize inflammatory softening.

6. Thrombosis and embolia of the brain give rise to various lesions, of which softening is only one of the most prominent. This shows itself especially when obliteration of the vessels has its origin in fatty or atheromatous degeneration, whether of the capillaries, or any other portion of the vascular system. The lesions referred to vary according to the nature of the obstructing substance, and the number, size, and extent of the obstructed vessels.

7. Inflammatory thrombosis or phlebitis of the sinuses, and proper thrombosis of the sinuses, differ as well in the lesion as the phenomena. The former is often connected with purulent infection, the latter never. It is with the latter that cerebral softening is especially associated.

8. The different forms of softening dependent on obstruction of the encephalic vessels, arteries, veins, or capillaries, have anatomical and clinical characters which distinguish them from other forms of softening, with which they have been too often confounded.

9. There appear to be three kinds of cerebral softening. The *first* consists of cases dependent on vascular obliteration or cerebral hemorrhage, of which the original cause is generally, if not always, a lesion of the vessels or the heart. The predominant character of this group is that the cerebral change is subordinate to disease of the circulatory apparatus. The *second* category, not less important, includes cases in which there is primary alteration of the elements of the connective tissue of the brain, or in other words inflammatory exudation, &c. In the *third* class, the changes affect especially the nerve-elements themselves—as myelocytic tumours, and cerebral affections dependent on a poisoned condition of the blood. (*Archives Gén.*, Avril, 1868, p. 464.)—*Note to the sixth edition.*

cured, as too frequently happens from the irremediable nature of the cause, life may often be considerably protracted.

2. Hypertrophy of the Brain.—This is an increase in the bulk of the brain from excessive nutrition, in other words an *over-growth* of the organ. Not unfrequently, upon opening the cranium and dura mater, in post-mortem examinations of patients who have died of cerebral disease, the brain bulges out more or less through the opening, in consequence of a real or apparent increase of dimensions from congestion, inflammation, hemorrhage, or effusion into the ventricles. But this is not the affection alluded to in the present paragraph. In proper hypertrophy, the dimensions of the brain are not increased by the afflux of blood, or the formation of cavities within it containing liquid, but by an excessive production of the cerebral matter. When it occurs before the closure of the fontanels, so that the cranium may expand to correspond with the dimensions of the brain; or when the cranium is developed proportionably with the brain itself, the head may be so large as to occasion some inconvenience by its weight; but the affection can scarcely be considered as morbid. The case is much otherwise, when, as generally happens, the skull refuses to yield, and the brain is consequently compressed within dimensions which are too narrow for it. Under these circumstances, it constitutes a serious, though happily a very rare disease.

When the dura mater is divided, the cerebral mass projects through it, as if too large for its unyielding envelope. The convolutions appear flattened, and as it were "heaped upon one another;" the ventricles are obliterated; no serum is discoverable in any part of the cranial cavity; the membranes are remarkably dry; the blood-vessels are empty; the cortical portion appears blanched nearly to the paleness of the medullary; no red points are seen when the brain is divided; the cerebral substance is firmer than in health; and the whole brain considerably heavier. It is obvious that fluids have been in great measure excluded by the accumulation of the cerebral matter. The cerebellum is in general not involved in the disease.

Symptoms.—The affection may exist long with little observable derangement of health. Among the first symptoms is usually headache, which occurs generally in paroxysms, and is often exceedingly violent. In some instances, these paroxysms are attended with vomiting. After a longer or shorter time, other symptoms appear, of which the most prominent are convulsions. These are sometimes of an epileptic character, sometimes partial, affecting one or more limbs, the face, or one-half of the body. At length, the senses become affected; dimness of vision or temporary blindness occurs, especially during the paroxysms of headache and vomiting; hearing and the sense of touch are impaired; and, though palsy may not take place, there is uncertainty in the movements of the patient, who obviously has not complete control over the muscles. The mind, at first little disordered, and sometimes correct to the last, generally fails more or less as the disease advances; and depression of spirits, indifference, loss of memory, and intellectual hebetude come on, ending in permanent delirium or imbecility. The organic functions suffer little in the progress of the complaint. With the exception of occasional vomiting during the paroxysms, the digestive organs are scarcely deranged; the skin remains cool; and the pulse, if in any respect altered, is somewhat slower than in health. At last, however, the convulsions become almost incessant; the bodily powers give way, and the patient, if not carried off by some incidental disease, dies with coma, convulsions, or syncope. The disease is often several years in running its course; during which, though there may be occasional remissions and partial amendment, the symptoms on the whole gradually become graver to the end.

The chronic character of the affection distinguishes it from acute menin-

[illegible] and paralysis, from cerebritis. This last [illegible] distinguish it from tumours in the brain. With [illegible] chronic effusion into the ventricles, it might easily be [illegible] the latter, when unattended with enlargement of [illegible] gives the following diagnosis between hydrocephalus [illegible] children. The cerebral disturbance is much more marked [illegible] the head is enlarged, and ossification of the skull is [illegible] enlargement is less in hypertrophy, and the fontanels and sutures [illegible]. Nor is there tension or prominence of the anterior fon[illegible] hydrocephalus, but on the contrary an actual depression in this [illegible] shape of the head is less rounded; the occiput being the first [illegible] hypertrophy, and often continuing throughout to keep this [illegible]. When the forehead projects, the eyes remain deep in their [illegible] the prominence and downward direction given to them by [illegible] of the fluid in hydrocephalus upon the orbitar plates.

[illegible] causes of hypertrophy of the brain are quite unknown. The affection [illegible] and comes under the notice of the physician at too late a period, to [illegible] very accurate investigations to be made.

3. Atrophy of the Brain.—This term may be made, for the sake of [illegible], to include cases both of diminution of the cerebral substance occurring after birth, and of congenital deficiency of the organ, though the lat[illegible] affection is technically denominated cerebral *agenesis*.

The deficiency may occur on one side or on both; but the former event is most common. The brain retains its natural consistence. The vacuity is usually filled up with watery fluid. Sometimes the cranium is depressed over the seat of the atrophy, giving a deformed appearance to the head.

The affection may continue long without interfering materially with the organic functions; but it is generally attended with palsy of one or more limbs, or of one-half of the body, upon the opposite side to that in which the atrophy exists. In some instances, rigid contractions complicate the paralysis. Epileptic convulsions are frequent accompaniments. The senses are sometimes affected, but rarely to any great extent. The mind almost always suffers more or less. The memory is apt to be defective, the rational powers feeble, the passions irregular, and sometimes strong; and not unfrequently the patient is nearly or quite idiotic.

The causes are little known. The congenital affection has been ascribed to accidents to the mother during pregnancy, but always with some uncertainty. The acquired variety is sometimes traced to convulsions occurring in infancy, or to injuries of the head received at the same period of life.

The patient often lives many years; sometimes to old age; and death almost always accrues from some disease not immediately connected with the cerebral affection.

4. Tumours in the Brain.—Most of the varieties of tumour which are found in other parts of the body, are occasionally also met with in the substance of the brain. Cysts, non-malignant tumours, the different forms of carcinoma or cancer, tubercles, and hydatids are sometimes generated in the midst of the medullary or cineritious structure, and produce the most deadly effects.* After attaining a certain degree of development, it is of little consequence what the nature of the tumour may be. The effects are alike malignant. The progress of the symptoms may be more or less rapid; but there is a strong resemblance in their character; and their tendency is constantly towards death. While the tumour is yet small, it often happens that no inconvenience is experienced; and, in consequence of its frequently very gradual growth, the brain so far accommodates itself to the encroachment, that considerable magnitude has been sometimes attained without serious results. Thus, dissection after death from diseases in no way connected with the brain, now and then reveals cerebral tumours, the existence of which had never been suspected. But, when a certain magnitude has been attained, which is different in different cases, the circumstance that the brain occupies a cavity which cannot be enlarged, and cannot be much encroached on with impunity, gives to productions, elsewhere innocent, an influence scarcely less noxious than that of the most malignant. The ill effects of these tumours are such as arise from direct compression of the cerebral substance, from irritation of the brain generally, from inflammation with softening, suppuration, &c. of the structure in their vicinity, and from compression of the veins, producing effusion in the ventricles, or chronic hydrocephalus. The symptoms, therefore, must be the same as those which characterize the several affections mentioned. It is not the tumour which yields the signs directly, but the brain upon which it acts.

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* Dr. Griesinger has examined especially into the subject of the hydatids or cysticerci of the brain; and the following is a summary of his conclusion from the history of 50 or 60 cases, of which two were under his own observation. The animals are found more especially in the outer gray matter of the brain. He makes five divisions of the cases described; 1. those which offer in their course very obscure symptoms or none; 2. those attended with epileptic convulsions, without mental disorder; 3. those combining epilepsy and mental disorder; 4. those having mental disorder with various sensitive or motor disturbance, but without epilepsy; and 5. cases with neither epilepsy nor derange-

Tubercles are the most frequent and most interesting of these products. As existing in the meninges, they have been already noticed. (See *Tuberculous Meningitis.*) Reference is here had only to those embedded in the cerebral substance. Their shape is usually spherical, and they are found of all sizes, from that of a millet-seed to that of a hen's egg, or larger. Their numbers vary from one to twenty or more; but they are much less numerous than usually in the membranes. Their consistence is that of the crude yellow tubercle. Sometimes masses of the translucent gray matter are found, with portions of the yellow within them. The larger are sometimes formed by the aggregation of smaller tubercles. They occur most frequently in the hemispheres, and are more common in the cerebrum than the cerebellum. The brain around them is often injected, softened, or suppurating.

Symptoms.—Headache is very generally the first symptom observed. It is usually paroxysmal, and sometimes intensely violent. It may be general, or confined to a particular part of the head, though nothing can be inferred from its position, with an approach to certainty, in relation to the exact site of the tumour, unless, perhaps, we may consider its fixed location at the nape of the neck as indicative of disease in the cerebellum. The pain often continues for a long time without any other prominent symptom, besides the vomiting which

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ment of mind, but with various evidences of cerebral irritation or torpor, either of an acute or chronic form. The mental disorder has nothing peculiar, showing itself sometimes as mania, delirium, or simple confusion of mind; sometimes in the form of obstinacy, or imbecility. Other cerebral phenomena often occur, as strabismus, alteration of the pupil, sensitiveness to light, headache, coma, anomalous sensations in the limbs, &c. Dr. Griesinger seems to think that we are not without the means of forming a diagnosis of these animals, based, 1. on the improbability of the existence of any other known affection, and 2. on the presence of a characteristic series of symptoms. When the epileptic attacks come in a sub-acute form, or quickly increase to a certain height, and, soon after a steady increase in number and intensity, assume the appearance of very severe cerebral disease, there are grounds for suspecting the cysticercus. The suspicion would be increased, if the person attacked were a healthy adult, exempt from hereditary predisposition or syphilitic influence, or lesion of the heart or blood-vessels. Mental depression or confusion, with giddiness, loss of sight and hearing, headache, coma, &c. would still further increase the suspicion, which would become certainty, were there manifestations of cysticerci elsewhere in the body. Should paralysis exist, it would be regarded as an almost certain contraindication. (*B. & F. Med.-chir. Rev.*, Jan. 1863, p. 250.)—*Note to the sixth edition.*

frequently attends it. Epileptic convulsions very often ensue, and continue subsequently throughout the complaint. Sometimes the spasmodic movements are confined to a particular part or parts of the body. More or less coma not unfrequently follows the convulsive paroxysms. Vision is apt to become deranged or impaired; and temporary blindness sometimes coincides with the cephalalgic and epileptic attacks. The local palsy, contraction of the flexors, and muscular rigidity, which characterize cerebritis, are often experienced as the disease advances; and they have almost invariably proved to be upon the side opposite to that occupied by the tumour. The mental faculties are usually at first little disturbed; but memory begins to fail after a time, sensation and perception are blunted, the rational powers are enfeebled, and a state approaching dementia not unfrequently ensues before the close of the complaint. Such affections are seldom fatal under a year, and they sometimes continue many years. All the general symptoms of chronic hydrocephalus sometimes precede death, which usually occurs in the midst of coma or convulsions.

The above symptoms are not all present in every case. Sometimes one, sometimes another is more prominent; and not unfrequently a few are associated to the exclusion of the remainder.

Attempts have been made to establish a diagnosis not only between tumours and other diseases, but between the different kinds of tumour. But it is seldom more than conjectural, except when the cerebral symptoms may happen to coincide with some affection in other parts of the body, which may serve as a clue to that of the brain. Thus, any form of cancerous disease, within the reach of observation, would point to cancer as the probable cause of the cerebral phenomena; and the existence of tubercles in the brain might be inferred, with an approach to certainty, if the symptoms above enumerated should coexist with those of external scrofula, phthisis, or tuberculated mesenteric glands. In relation to the tumours generally, the most diagnostic signs are the very gradual approach and advance of the symptoms, with the occurrence of local rigidity and paralysis. As to the part of the brain occupied, all is uncertainty. Should the pain be confined to the back of the head, and the patient exhibit a peculiarly staggering gait, or the want especially of the power of properly associating his movements, there might be some grounds for suspecting the cerebellum as the seat of the disease.

The diseased condition with which tumours are most liable to be confounded is that of chronic abscesses of the brain. The symptoms of the two affections are, indeed, almost identical. They may, however, generally be distinguished at some period of their course. When the symptoms are preceded by a blow or wound, they are probably due to an abscess, but not with absolute certainty, for cases have undoubtedly occurred in which a non-inflammatory tumour in the brain has speedily followed an injury, and was probably induced by it. If preceded by otorrhœa, disease of the upper bones of the nostrils, or caries in any part of the cranium, there would be little or no doubt that they indicate an abscess. In this affection, moreover, there is very generally a commencing stage of excitement which does not occur in tumours. There is more pain at this period; some febrile symptoms may occur; and vomiting, followed by stupor, convulsions, or paralysis, gives serious ground for apprehension. But these symptoms, if the patient survive, often decline, the general health appears to be much improved, and a cure may even be supposed to have taken place; but a relapse occurs, and, in assuming a chronic march, the abscess presents the ordinary phenomena of the affection. In tumours the symptoms are almost always comparatively mild at first, and, with the tendency to remission and exacerbation which marks most chronic complaints, upon the whole go on steadily increasing to the end. Tumours diminish the capacity of the cranium more than abscesses, and as a general rule are attended with more decided symptoms of compression. The attendant headache is usually more violent, unless in the earliest stage. Convulsions are probably more frequent in abscess. Tumours are generally slower in their march, and of longer duration, so that an affection which has continued very long may be preferably ascribed to them.*

Treatment.—Unfortunately this can be of little avail. There is, however, one rule applicable to all these cases of organic cerebral disease. In most of them, there is so much uncertainty in the diagnosis, that we may be justified in ascribing the symptoms to chronic inflammation of the brain, and treating them accordingly. Should existing debility, therefore, not forbid, the measures recommended in cerebritis may be carried into effect; the caution being always observed not to use depleting remedies rashly, nor to prostrate the system irrecoverably. As a general summary of the treatment, may be mentioned occasional leeching or cupping to the temples, or back of the neck; frequent moderate purging; revulsion by means of perpetual blisters, setons, issues, or pustulating applications behind the ears, at the back of the neck, or between the shoulders; a diet chiefly of vegetable food and milk, with the lighter kinds of flesh, when the strength appears to fail; and, finally, a moderate and sustained impression from mercury, or the iodide of potassium. These measures should be persevered in for months, and, if found productive of benefit, for years; with occasional interruptions as circumstances may seem to require, especially in relation to the mercurial treatment. In conjunction with them, the utmost care should be observed to guard the patient against causes likely to aggravate the disease, such as excessive mental or bodily exertion, emotional excitement, sudden vicissitudes of temperature, &c.

In tuberculous cases, the antiphlogistic treatment must be used with more caution, and the mercurial omitted altogether. The constitutional remedies adapted to scrofula should be used, such as the preparations of iodine, the chalybeates, the mild vegetable tonics, cod-liver oil, moderate exercise, &c.

In cases which are clearly cancerous, the measures should be palliative; and the same may be said of all the other cases, when the perseverance or aggravation of the symptoms, notwithstanding all the means employed, sufficiently proves the incurable nature of the malady.

Article III.

APOPLEXY.

Apoplexy (*αποπληξια*, from *απο* and *πλήσσω*, I strike) is a disease characterized by the sudden loss, more or less complete, of sensation, voluntary motion, and consciousness, without a suspension of respiration and circulation, and depending on pressure upon the brain, originating within the cranium. It is necessary to include the immediate cause of the symptoms in the definition; as otherwise there are many affections, which, being attended with the phenomena above mentioned, would necessarily rank with apoplexy, without having any strict pathological relation to it. Such, for example, is the coma which sometimes marks the onset of certain malignant fevers, that resulting from various narcotic poisons, and that which occasionally accompanies encephalic inflammation, hysteria, and gastric irritation. Between these affections and true apoplexy, the real difference in character is so great that they could not with any propriety be ranked in the same category. Pressure upon the brain enters essentially into the definition; and the pressure, moreover, must be somewhat sudden, and not the result of a slow organic growth, or very gradual liquid accumulation. Besides, it must originate within the cranium, as otherwise we should be compelled to rank compression of the brain, from fracture and depression of the bone, with apoplexy.

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* Those who may be disposed to prosecute the study of morbid growths, deposits, &c. in the brain, are referred to a paper by Dr. John M. Ogle, in the *B. & F. Medico-chirurgical Review* (July and October, 1865, pp. 200 and 491), in which are recorded numerous cases, with an account of the symptoms during life, and the result of careful microscopic examination after death. (*Note to the sixth edition.*)

By some writers the attempt has been made to identify the term apoplexy with cerebral hemorrhage. But, in the present state of our knowledge, it is quite impossible to determine, in very many instances, whether hemorrhage exists or not; and, if this definition of apoplexy were admitted, it would be necessary to include in the same category the most overwhelming stroke of the disease, as ordinarily defined, and the slightest local paralysis which might proceed from a little hemorrhage about some nervous centre.

In all cases of true apoplexy, the symptoms are produced either by simple congestion of the brain, hemorrhage within the cranium, or sudden serous effusion; and the disease has been distinguished by some writers according as it is attended by one or the other of these pathological conditions, into the *simple* or *nervous*, the *sanguineous*, and the *serous*. But such a division is useless for practical purposes; for we are in possession of no means of diagnosis which can be certainly relied on; and the treatment is determined not so much by our views of the exact pathological condition of the brain, as by certain exterior symptoms which may equally belong to the three varieties, and are liable to the same diversity in all of them.

Symptoms, Course, &c.—In many instances, the attack of apoplexy is preceded by certain symptoms which prove that the brain is unsound. Among these are a feeling of weight or fulness in the head, vertigo, headache and vomiting, drowsiness, dim or perverted vision, noises in the ears or temporary deafness, defect of memory, confusion of thought, apprehensions of impending evil, flushings of the face, epistaxis, numbness or formication in some portion of the body, unsteadiness of gait, faltering speech, and other evidences of slight partial palsy. Many other symptoms are enumerated by authors, but most of them have only an accidental relation to apoplexy, and need not, therefore, be repeated. Of those above mentioned, there may be only one present in a particular case, or there may be several; and they may precede the attack, in greater or less degree and more or less continuously for months, or only for a few hours or even minutes. Great difference exists among authors, as to the proportion of cases in which the premonitory symptoms are observed. Rochoux declares that of 69 cases, of which he has collected the history, 11 only presented precursory symptoms. (*Dict. de Méd.*, iii. 470.) But my own observation conforms much more nearly with the statement of Dr. Bennett, that apoplexy rarely occurs without premonitory symptoms, though they may occasionally be so slight as to escape notice. (*Tweedie's Syst. of Pract. Med.*) It is certain, however, that the stroke does sometimes approach without warning, and in the midst of apparently sound health.

When attacked, the patient, if standing or sitting, usually falls, deprived of consciousness, and more or less completely of sensation and the power of motion. If a limb be raised and let go, it falls as if destitute of life. Pinching the skin seems to occasion no uneasiness. Sight and hearing are suspended, and the patient is not roused by shaking, or by calling loudly in his ear. The countenance is marked by total absence of expression, and is often turgid with blood. Throbbing of the carotids is not uncommon. The pulse is full, slow, strong, and sometimes intermittent. This condition of the circulation, though not universal, is yet so frequent that, when a similar pulse is met with in other affections, it is often said to be apoplectic. The respiration too is slow, and frequently stertorous. The pupil is in some instances dilated, in others contracted, but generally immovable, and insensible to light. The power of deglutition is usually much impaired, and sometimes lost. The bowels are generally constipated; and the urine is either passed involuntarily, or accumulates so as to distend the bladder, and then dribbles away under mere gravitation or pressure. Though the limbs are usually motionless, there is sometimes spasmodic contraction or rigidity of the muscles, which is generally confined to one side, while the other is quite relaxed.

This condition of stupor continues variously from a few minutes to several days, sometimes even to the sixth or seventh day, when, if a fatal result does not take place, it slowly gives way, either spontaneously, or to the remedies employed. The patient, upon beginning to recover his consciousness, often has a peculiar expression of countenance, as if astonished. The symptoms may now all gradually decline, and health returns without any remains of the disease. But this result is comparatively rare. Much more frequently it is observed, when the patient begins to exercise a little power over the muscles, that some part of the body, and generally one-half of it in the longitudinal direction, is more or less completely paralyzed. Indeed, this condition of hemiplegia may often be seen at the commencement of the attack; one side of the body retaining a certain degree of contractility and sensation, while the other appears quite insensible and powerless. Sometimes, however, the palsy is less extensive, affecting only a single limb, one side of the face, the tongue, &c. Generally both sensation and the power of motion are lost, but sometimes only one. The side affected is apt to be opposite to the one convulsed; though, in some instances, the muscles which refuse to obey the will contract spasmodically. The paralytic condition of the face is rendered obvious by the fallen and relaxed state of the features on the affected side; while there is a certain degree of contraction in the muscles of the other side, towards which the angle of the mouth is drawn. When the tongue is protruded, the point turns towards the paralytic side, because the muscles which draw it forward act only upon the other half of the organ. In consequence of this palsy of the tongue, the patient on recovering consciousness is often unable to speak, or articulates imperfectly.

These paralytic symptoms may disappear in a few hours or a few days, or may continue for months, or years, or to a greater or less extent during life. Upon the return of consciousness, the patient sometimes complains of headache, and symptoms of delirium not unfrequently appear. If these should be considerable or lasting, with wakefulness, an accelerated pulse, and some heat of skin, there would be reason to suspect the occurrence of inflammation. After convalescence from the apoplectic symptoms, the palsy often remains for a long time; the mind appears not unfrequently weakened; the patient is apt to shed tears upon slight occasions, or without any occasion; the memory is often defective, and words are miscalled, or one substituted for another of a wholly different meaning; and, in some instances, it is long before the patient recovers the power of speech after having lost it. After a time, however, which varies in different cases from a few months to several years, the apparently wrecked system is often gradually repaired by its own inherent powers; and the patient, though seldom as vigorous in mind or body as before the attack, regains a tolerable share of health, and is able to enter again into the routine of active duties.

When the apoplectic attack is to end fatally, it seldom terminates before the lapse of three or four hours, and much more frequently not till the third or fourth day. Immediate death is very rare; and the patient seldom survives the eighth day. Before death, the coma, if at first imperfect, becomes profound; the sphincters frequently give way; the pulse sinks in force and volume, [illegible] extremities become cold; the surface often [illegible] and the respiration is performed at gradually [illegible]

[illegible] of the disease as it most frequently appears [illegible] diversities. In some instances, instead of striking [illegible] comes on by degrees, with a drowsiness increas[illegible] ending in profound coma, or going off without a [illegible] at any time. Even in the sudden attacks there [illegible] of sensation or consciousness; the patient some[illegible] signs of intelligence when spoken to loudly. Occa[illegible] of some one part of the body, precedes the apo[illegible] the patient, before losing his consciousness, finds him[illegible] to open and close one of his eyes, or to move the arm [illegible] side, or finally to move any portion of that side. Now and [illegible] instances in which these paralytic symptoms occur without [illegible] at any time. In one winter no less than four or five hemi[illegible] brought into the Pennsylvania Hospital, in which the pa[illegible] their consciousness for a minute. These, however, are [illegible] affection will hereafter be treated of under palsy.

[illegible] face, and the strong full pulse which ordinarily cha[illegible] there may be paleness of the countenance, and a small [illegible] these respects there is every possible grade between the [illegible] Sometimes we meet with instances in which the force of the [illegible] at once overwhelming. The vital powers yield immedi[illegible] features, cold skin, and scarcely perceptible pulse indi[illegible] system closely resembling syncope.

[illegible] describes a form of apoplexy, commencing with sudden [illegible] attended with paleness of face, faintness, nausea, and gene[illegible] The skin is bloodless; the pulse is feeble, and frequent, or [illegible] the patient either falls, in a state approaching to syncope, [illegible] some degree of convulsion, or simply experiences slight and [illegible] of mind. In either case, the symptoms pass off, with the [illegible] headache. After a variable interval, which may not exceed [illegible] hours, or may extend to several days, comatose symptoms [illegible] on with or without paralysis, and death ensues. In these [illegible] to Dr Abercrombie, there is always copious extravasation [illegible] symptoms are of the worst possible augury.

[illegible] the symptomatology of apoplexy, it will tend to render the [illegible] we consider successively the several phenomena which are [illegible] of the disease.

[illegible] though commonly full, slow, and strong, and not unfrequently [illegible] intermittent, is in some instances scarcely different from that of [illegible] others small, feeble, and more or less frequent.

[illegible] two phenomena in the *respiration* which are worthy of notice. [illegible] snoring sound in inspiration, and a peculiar noisy puffing out [illegible] in expiration; the former probably arising from the torpid state [illegible] pendulum, the latter from an equally torpid state of the bucci[illegible] other muscles of the face. Neither of them is present in every [illegible] usually indicate deep stupor, and the flapping of the cheeks is [illegible] of the two. The breathing is generally slower than in health, [illegible] irregular, and sometimes sighing or yawning.

The [illegible] most frequently flushed, more or less turgid, and of a red, pur[illegible] but it is sometimes also pale, or of a yellowish or gree[illegible] so that the colour is by no means to be relied on as a diagnostic symp[illegible] There is always, however, a characteristic want of expression in the countenance, a deep soporose aspect, which serves to distinguish the affection, in many instances, from other forms of coma.

The *pupil* is in bad cases quite immovable, being either contracted or dilated, or one pupil being in one state, while the other is in the other. When the apoplexy is not profound, it is often sensitive to light.

It has been already stated that *convulsive movements*, when they occur, are generally upon the opposite side to the one paralyzed, though sometimes they occupy the same side, and are occasionally general. In some instances, tonic spasms and muscular rigidity are observed. These involuntary contractions may precede, accompany, or follow the apoplectic attack.

Paralysis is present in the greater number of cases, and is thought to be very seldom wanting when there is hemorrhage. In some violent cases, all the limbs are paralyzed; but generally the affection is confined to one-half of the body, having the form of hemiplegia. Sometimes only a single limb is affected; and, in this case, the arm is much more frequently paralyzed than the leg. It is a singular fact, moreover, that, in recovery from hemiplegia, the leg almost always regains its powers and sensibility much before the arm; and it not unfrequently happens that the patient can walk, while the arm still hangs, like a dead weight, by the body. The paralysis may also be confined to the face, the tongue, the eyes or their lids, the œsophagus, or the larynx. In the face it produces, as already observed, inequality of the two sides; in the tongue, difficulty of articulation or inability to articulate at all, while the organ, when protruded, is apt to point towards the paralyzed side; in the eye, want of vision, and often dropping of the eyelid, or its imperfect closure; in the œsophagus, inability to swallow, with symptoms of suffocation when the attempt is made; in the larynx, loss of voice. But the disease is very rare in the last two positions. In general the palsy affects both sensation and motion; but sometimes it is confined to one of these properties.

Consciousness is affected in various degrees. As a result of pressure of the brain, there is every grade of stupefaction, from a slight confusion or vertigo, to profound coma. The case, however, scarcely meets the definition of apoplexy, unless consciousness is suspended, at least for an instant. It is said that, at the moment of attack, the patient sometimes has a feeling as if something were suddenly torn or rent in the interior of the head.

After recovering in some degree from the proper apoplectic symptoms, the patient is liable to be attacked by those of cerebritis, consequent upon inflammation excited in the cerebral substance by the presence of effused blood.

Though entire recovery not unfrequently takes place from one attack of apoplexy, and even from all its apparent consequences, there is yet liability to returns of the disease, which in general, sooner or later, prove fatal. A third attack of the severer kind is seldom survived. Of that milder form, however, which depends on mere cerebral congestion, without effusion, the result is much less fatal; and it sometimes happens that a patient has numerous attacks, which reduce him at length to a state of mental imbecility little short of idiocy.

Anatomical Characters.—It is now generally admitted that death may occur with all the phenomena of apoplexy, without leaving any observable lesion in the brain. Such cases are denominated by some nervous apoplexy. They are very rare. The probability appears to me to be, either that some slight phenomena of congestion have been overlooked, or that the blood-vessels, violently distended within a moderate space, sufficient to paralyze the action of one of the nervous centres essential to life, have become emptied of blood before death, after the mischief had been produced.

In other cases, nothing which could account for the symptoms is discovered but a highly congested state of the cerebral vessels.

It has been long known that patients sometimes die of apoplexy produced by the sudden effusion of serum into the ventricles, or the cavity of the arachnoid. The serum is sometimes limpid and colourless, sometimes turbid and reddish or yellowish. It may be wholly unattended with signs of inflammation or congestion, and apparently the result of a sudden extravasation of watery fluid, such as is occasionally observed in dropsy of the serous cavities. Such a case is related by Andral, in which a large quantity of perfectly transparent and limpid fluid was found in a cavity produced by the union of the two lateral ventricles with the third; the septum lucidum and fornix having been reduced into small fragments of white pulp, floating in the serosity. (*Clin. Méd.*, v. 95.) Another, by Dr. J. Da Costa, of Philadelphia, is recorded in the *Charleston Medical Journal* (March, 1859, p. 141), in which, after suffering long with violent intermittent pain in the head, with vomiting and restlessness, the patient was suddenly seized with unconsciousness, and died. The brain and cerebellum were perfectly healthy, and no other morbid condition was found than engorgement of the choroid plexus on one side, and copious serous effusion, with which both ventricles were distended, measuring nearly four ounces. Sometimes the effusion is attended with distension of the veins and sinuses of the brain, or with general congestion of the organ.

But hemorrhage within the cranium is the most frequent lesion. The blood may be effused between or upon the membranes, in the ventricles, or in the substance of the brain. A case was recorded by Dr. John Watts (*Med. and Surg. Register of the New York Hosp.*, A. D. 1818, p. 145), in which blood was effused between the dura mater and the cranium, in consequence of caries of the inner table, of about the size of a sixpence, producing the rupture or erosion of a blood-vessel. It is more frequently found in the cavity of the arachnoid, diffused over the surface of the whole brain, or one of the hemispheres. Sometimes it occupies cysts made by laminæ of false membrane upon the free surface of the arachnoid. (See *Arch. Gén.*, 4e sér., xxii. 87.)* It

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* *Meningeal Apoplexy. Pachymeningitis.* As stated above was the condition of our knowledge on this subject, when the present treatise was prepared. I have allowed the text to remain unchanged; for what is there given is still correct, though deficient in reference to our present knowledge on the subject; and propose introducing what is to be said additionally in the form of a note, which will give larger scope for the newly ascertained facts. Two essays on this subject have appeared in the *Archives Générales;* one by Dr. E. Lancereaux in Nov. and Dec. 1862 (pp. 526 and 679); and the other, which is an abstract of the original thesis, presented to the Faculty of Strasburg, in 1864, by M. Jules Christian, in April, 1865 (p. 483). From these, which appear to exhaust the subject, I take the following summary.

There are two varieties of meningeal hemorrhage. In one, the blood proceeds from rupture of the vessels of the meninges, and will be found either in the cavity of the arachnoid, underneath that membrane, or between the dura mater and the bones of the cranium. In these cases the attack is generally sudden, and attended with the ordinary phenomena of apoplexy. In the other variety, the hemorrhage takes place from the vessels of false membrane, consequent on previous inflammation of the dura mater. It is this which we are now to consider. A simple reference is made to it in the text.

The dura mater is double, the outer layer acting as periosteum to the inner surface of the cranium, and supporting the meningeal vessels; the inner being the true membrane of the brain. Of this the various processes consist, and within its folds are the venous sinuses of the brain. Instead of the arachnoid, formerly supposed to cover the inner surface, it is asserted by Luschka, Virchow, and others, to be lined merely by a layer of pavement epithelium. Like all fibrous tissues, the dura mater is liable to inflammation, though suppuration is rare. Virchow has conferred on this inflammation the name of *pachymeningitis*, implying the thickness of the membrane affected. During the inflammation, lymph is exuded through the epithelium into the arachnoid cavity, where layer after layer of it undergoes organization, by which it is converted into areolar tissue. Blood-vessels form in great numbers in the false membrane thus originating; but they possess a feeble vitality, and are strongly disposed to fatty degeneration. Hence they are apt to rupture, and the blood escapes into the substance of the new tissue, or into the arachnoid cavity, or between the new structure and the dura mater. Generally it is contained between the laminæ of the false membrane. The inner surface of this new tissue may occupy the lateral, the third, and the fourth ventricles, having sometimes been found in one or more of these cavities, and sometimes in all. In some instances, it has been found in the ventricles and the arachnoid cavity, communicating with a collection of blood in the cerebral substance. In such cases, it is supposed that the fluid has broken a passage from its source in the brain, through the substance of the organ, into the cavities.

Beyond all comparison, the most frequent form of hemorrhage is that which occurs in the tissue of the brain. When this is met with after sudden death, it is usually accompanied with evidences of general congestion within the cranium; the sinuses of the dura mater being full, the pia mater infiltrated with blood, and the cut surface of the brain exhibiting numerous little drops of blood. The extravasated blood is sometimes apparently infiltrated into the cerebral substance; but much more frequently is collected in a cavity, which it has hollowed out for itself. The quantity found in such cavities varies from a few drops to six ounces or more. The situation of the cavity may be in any part of the brain or cerebellum, though, according to Rochoux, it is very seldom in the white substance. It is almost uniformly upon the side of the brain opposite to the paralyzed side. Nevertheless, cases have been recorded, in which the effusion has been on the same side as the palsy. When the hemorrhage occurs on both sides of the brain, the palsy is apt to be on the side opposite to the larger cavity. There is a singular tendency to hemorrhage in the substance or vicinity of the corpora striata and optic thalami. Of 386 cases of cerebral and spinal hemorrhage compared by Andral, 202 showed extravasation in the hemispheres on a level with these bodies, and at the same time in them; 61 in the corpora striata, and 35 in the optic thalami. Of the remainder, 22 were in the cerebellum, 8 in the spinal marrow, and 58 in other parts of the brain. The greater disposition to hemorrhage in these bodies and their neighbourhood, is ascribed to their greater vascularity.

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is covered with a smooth epithelial layer, which has caused it to be sometimes mistaken for the arachnoid. It is, indeed, altogether so transparent that it is difficult by the eye to distinguish it from the normal tissue; but its layers may be separated by rubbing it with the finger. The blood contained within it appears, sometimes, as if it were in a cyst attached to the dura mater; and occasionally this connection is separated, and then the bag constitutes apparently a loose cyst floating in the arachnoid cavity. The quantity of blood thus effused varies exceedingly, from a few "grammes," to several hundred; though, in the adult, it seldom exceeds from 30 to 60 grammes (one or two ounces). In children, before the closure of the fontanel, it is often much more. Generally there are several foci of effusion. The blood is red or blackish according to the length of time that it has been effused; and shows all the changes referred to in the text as taking place in apoplectic blood.

In general the blood from this origin is found at the vault of the cranium, near the anterior and middle parts of the hemisphere, rarely at the base, proving that the escape of the blood is not the first step in the morbid process. Most commonly it is on both sides, though sometimes confined to one. The dura mater itself is little altered; but the arachnoid cavity is sometimes obliterated by adhesions. The substance of the brain is often atrophied, and even softened near the cyst. The symptoms are very uncertain, because the disease is seldom quite isolated; and it is difficult to decide which of the phenomena proceed from the special disease. The symptoms enumerated are headache, vertigo, slight intellectual disorder, loss of speech, contracted pupil, insomnia at first, afterwards somnolency or apathy, contraction of the limbs and trunk, feebleness of the limbs, partial palsy, uncertainty of movement, epileptic attacks, sometimes delirium and coma before death. The progress of the disease is generally chronic, though death is sometimes sudden. There is little doubt, however, that many cases end in recovery.

The causes of this special form of apoplexy are unknown. The abuse of alcohol, rheumatism, and despondency have been supposed to have some influence in its production. Bright's disease is also thought to predispose to it; and Dr. Wilks believes that the apoplexy which attends this disease is generally meningeal. (*Med. T. & Gaz.*, Dec. 1863, p. 615.)

As to the treatment, nothing is specially recommended; and it must be conducted on the same principles as guide us in other forms of apoplexy. (*Note to the sixth edition.*)

The walls of the hemorrhagic cavity are for a depth of one or two lines deep-red, very soft, and of an irregular surface. Beyond this layer is usually another, from one to three lines thick, which is also soft, almost as much so as cream, but is of a light-yellow colour, and blends at its outer circumference with the healthy substance of the brain, so that no accurate line of separation can be drawn. (*Rochoux.*) It is asserted that the cerebral substance is sometimes also found perfectly healthy, immediately around the blood.

The effects of time upon the effused blood have been examined with much care. A few days after the effusion, it is in the form of a blackish, soft coagulum. This gradually loses its colour, and acquires increased firmness, becoming pale-reddish, or yellowish, and is at last wholly absorbed, leaving a cavity with smooth sides, which, if the cavity is small, are in contact without adhering, but, if large, are connected by transverse and interlacing filaments, forming a sort of areolar tissue, the cells of which are filled with a yellowish or reddish liquid of various consistence. If the hemorrhage was on the surface of the brain, a depression is left of larger or smaller dimensions. The coagulum may entirely disappear in four or five months, or may continue a year or two before being absorbed. Effusions of serum are sometimes found in old cases of apoplexy, as are also circumscribed softenings; and it is probable that these conditions contribute sometimes to the fatal result. It is thought by Rochoux that the effused blood always leaves a visible alteration of the cerebral tissue behind it; and that thus the number of attacks, which an individual may have experienced of proper sanguineous apoplexy, may be ascertained after death. It is not uncommon to find two or three of these cicatrices, and M. Moulin and Dr. Abercrombie have each seen four in the same individual. M. Cruveilhier has seen fifteen. (Rochoux, *Dict. de Méd.* iii. 485.) The cavities, however, filled by a yellowish coloured serum, which Rochoux considers the remains of apoplectic effusion, are, according to M. Durand-Fardel and others, the result merely of cerebral softening.

The blood effused into the natural cavities is much less readily absorbed than that which has formed a cavity for itself in the substance of the brain. In some instances, it coagulates, then gradually loses its redness, and appears ultimately to undergo organization, and to be converted into a kind of false membrane. In other instances, it becomes encysted, and is enclosed in a sac which has the appearance of a newly-formed serous tissue.

It must not be taken for granted that hemorrhage within the brain necessarily produces symptoms of apoplexy. A case is recorded in the *Medical Times and Gazette* (Dec. 1863, p. 588), in which a patient was seized with violent pain in the head, deathly sensations, vomiting, and general coldness and paleness of the surface without loss of consciousness, and without a trace of paralysis. The sight began to fail in three weeks, and this was the only serious symptom, besides those mentioned, up to the period of death. On examination, the brain was healthy except in the left middle lobe, where a hemorrhagic focus was found, with a few small extravasations in the corpora quadrigemina.

Causes.—That there is a condition of the system, or of the brain, constituting a predisposition to apoplexy, cannot be doubted. Among the causes which give rise to this condition, and which are, therefore, predisposing causes of the disease, *inheritance* is one of the most prominent. The complaint is much more likely, as a general rule, to attack individuals descended from apoplectic parents than others. *Old age* is another predisposing cause, and probably the most powerful. Apoplexy may occur at any age; but it is vastly more frequent in the old than the young. Indeed, the disease is very rare under twenty. It is true that hemorrhage into the arachnoid is not very uncommon in infants. But it is in general not marked by the usual apoplectic phenomena, and ranks, by the symptoms, rather with meningitis than with the disease at present under consideration. The age at which the predisposition is strongest is above fifty. Of sixty-nine cases collected by Rochoux, two were between 20 and 30, ten between 30 and 40, seven between 40 and 50, thirteen between 50 and 60, twenty-four between 60 and 70, twelve between 70 and 80, and one between 80 and 90. Thus, it appears that there were fifty cases beyond the fiftieth year, to nineteen short of it. When it is considered how much fewer are the numbers of persons living above fifty than below it, the disproportion, great as it is, will appear to be much increased.

It was formerly supposed that a certain physical conformation predisposed to apoplexy. Persons with large heads, short necks, red and turgid faces, full habit of body, and generally of a sanguineous temperament, were looked upon as doomed victims of this disease. It is true that some individuals thus constituted suffer with apoplectic attacks; but the vast majority escape; and the number of patients who want these characteristics is probably much greater than those who possess them. It is no uncommon event for tall and thin persons, with pale faces and small heads, to die of apoplexy.

Sedentary habits with high living have also been supposed to produce a predisposition to the disease by generating plethora. They undoubtedly favour its development, when the predisposition already exists; but in persons without any tendency to the complaint, it is very doubtful whether they would occasion it.

It is probable that certain organic diseases of the heart and of the lungs, by producing and keeping up for a long time congestion, either active or passive, of the vessels of the brain, may so derange their organization as to dispose them to rupture, and may thus act as predisposing causes of apoplexy. They are probably, however, more frequently merely exciting causes. The cardiac affection for which most influence of this kind is claimed is hypertrophy of the left ventricle. It appears, at first sight, reasonable to suppose that the vastly increased force, sometimes given to the current of blood by this condition of the ventricle, must be exerted with peculiar effect upon the vessels of the brain; and there can be no doubt that, when these vessels are already weakened, they will sometimes yield to the increased impulse, and rupture sooner than they otherwise would have done. Hence, cases have been repeatedly noticed, in which apoplexy and hypertrophy of the left ventricle were associated. But I believe that much more than the due importance has been attached by some writers to this cause. So far as my own observation has gone, comparatively few cases of disease of the heart terminate in apoplexy. Cardiac affections are very common in the Pennsylvania Hospital; and patients frequently die of their consequences; but, during the period of my attendance upon that institution, I cannot recall a case in which apoplexy resulted. M. Rochoux states that, of forty-two apoplectic patients whose bodies he examined, three only presented aneurism of the heart. (*Dict. de Méd.*, iii. 503.) Even in those instances in which the two affections have been found associated, it appears to me highly probable, as suggested by Dr. Watson, that they may have been quite as often merely coincident, as bearing to each other the relation of cause and effect. The same constitutional tendencies which occasion disease in the valves and parietes of the heart, would be likely to affect also the blood-vessels of the brain, and predispose them to rupture.

Syphilis sometimes disposes to apoplexy, generally in consequence of disease of the cranium and dura mater, but occasionally without any such antecedent affection. The complaint, when of this origin, mostly occurs in the young, whereas ordinary apoplexy is rare in this class of persons. It almost always depends on a focus of encephalitis. The first symptom of apoplexy is usually preceded by pain in some limited portion of the head. Sometimes the hemiplegia comes on slowly, with contraction of the muscles, or rigidity, loss of memory, vomiting, &c., ending at length in coma. When originating in the cranium, it may be recognized by the intensity of the antecedent pain, its tendency to nocturnal exacerbation, and the existence of tenderness on pressure, or of periosteal swelling in some one point of the head. (Griesinger, *Arch. Gén.*, Juin, 1861, p. 702.)

It has been ascertained, moreover, that organic disease of the kidneys is a very frequent antecedent to apoplectic attacks; and it is highly probable that the poisoned state of the blood resulting from the renal affection may contribute to the disease of the cerebral tissue, which so often precedes the hemorrhage. Out of 22 fatal cases of hemorrhagic apoplexy, Dr. W. S. Kirkes found the kidneys decidedly diseased in 14; and in 12 of these there was coincident disease also of the heart and cerebral vessels. (*Med. Times and Gaz.*, Nov. 1855, p. 515.) These cases certainly prove a close relation between the several morbid conditions referred to, either as the results of one common cause, or as exercising a causative agency among themselves. The probability is that all three conditions often result from a general morbid state of the system not well understood; but it is also highly probable, as before stated, that the disease of the kidneys acts injuriously both on the brain and heart, by rendering the blood impure, and that the heart when diseased co-operates with the kidneys in increasing the cerebral affection.*

It is a highly interesting question, what is the state of the brain which gives it a tendency to apoplectic effusion. There can be little doubt that organic changes in the *coats of the blood-vessels*, such, for example, as ossification, and atheromatous deposits, or fatty degeneration, may so far lessen their power of resistance as to lead to rupture upon the application of any unusual force. Hence, perhaps, in part, the peculiar liability of old people to the disease. An aneurismal state of the cerebral vessels has been occasionally observed, and it is possible that this may sometimes be the cause of rupture, even when it escapes observation.† The opinion appears to me very plausible, which as-

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* In a report of 42 cases by Dr. A. Eulenburg, there was an abnormal condition of the arteries at the base of the brain in 29, and hypertrophy of the left ventricle in 9. Of the 29 cases of vascular disease mentioned, 17 were attended with signs of endocarditis, 12 with disease of the valves, and 6 with hypertrophy of the left ventricle. Hence it is inferred that disease of the cerebral vessels is a more frequent cause of apoplexy than hypertrophy of the heart. (*Am. Journ. of Med. Sci.*, April, 1868, p. 479.)

Of 36 fatal cases at St. George's Hospital, London, reported by Mr. Jones, there was conjoint disease of the cerebral vessels, other vessels, the heart, and the kidneys in 10; of the cerebral vessels, heart, and kidneys in 22; of the heart and kidneys in 29; of the cerebral vessels and kidneys, in 22; of the cerebral vessels and heart in 24. In the absence of all these conditions, the attack of apoplexy is to be ascribed generally to accident. The author thinks that disease of the kidneys is most frequently the original fountain of the evil. (*Med. T. & Gaz.*, Feb. 1863, p. 174.) Too much importance, however, must not be attached to these lesions, considered either as immediate or predisposing causes of apoplexy. Very often they are mere coincidences, and have little to do with the disease, except as occasionally results of the same general cause. It is probable that a very large proportion of old persons would exhibit one or more of these lesions after death; and as apoplexy attacks the old in much the larger proportion, it will of course be found connected with these post-mortem appearances in a greater or less degree. (*Note to the sixth edition.*)

† *Aneurism in the Brain.* An essay on this subject has been published, by Dr. Wm. Gull, in *Guy's Hospital Reports* (A.D. 1859, p. 281), from which it would appear, that aneurism of the cerebral arteries is a more frequent source of apoplexy than was formerly supposed. It is sometimes difficult to detect the lesion after death, and it has probably often escaped discovery in post-mortem examinations. According to Dr. Gull, when young persons die of "ingravescent" apoplexy, and copious effusion of blood is found, especially if it be upon the surface of the brain, within the tissue of the pia mater, the existence of an aneurism is probable. Though the disease is most common in the larger arteries at the base of the brain, or in the fissures between the lobes, yet the smaller branches are sometimes affected, even after penetrating the cerebral substance. Of 62 cases, collected by Dr. Brinton and himself, 28 were in the vertebral arteries and their branches, and 34 in the carotids and their branches; and of the former 20 were in the basilar, and

e of apoplexy, in the greater number of cases, to a pre-
rebral *substance*, predisposing it to hemorrhage. This
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nce of the brain, as dependent in almost all cases
ning of the cerebral substance. Such a soften-
round the collection of blood; according to
one hundred cases. (*Ranking's Half-Yearly*
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is true that other observers, as Cruveilhier, Cars-
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cedent to it. It is asked, why the attack of apoplexy
ed by signs of cerebral disease, if so serious an organic
going on in the substance of the brain? But this objection
act, that such changes have frequently existed in organs with-
ous signs during life, and have been first revealed by dissection.
nere often are preliminary symptoms of a marked character; and
ars to me that the theory of M. Rochoux affords the best explanation
eir occurrence. Admitting the previous existence, in many instances,
is hemorrhagic softening, we have been, until of late, completely in the
as to its nature and immediate cause. But some observations of Mr.
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in the cranium, it may be recognized by the intensity of the antecedent pain, its tendency to nocturnal exacerbation, and the existence of tenderness on pressure, or of periosteal swelling in some one point of the head. (Griesinger, *Arch. Gén.*, Juin, 1861, p. 702.)

It has been ascertained, moreover, that organic disease of the kidneys is a very frequent antecedent to apoplectic attacks; and it is highly probable that the poisoned state of the blood resulting from the renal affection may contribute to the disease of the cerebral tissue, which so often precedes the hemorrhage. Out of 22 fatal cases of hemorrhagic apoplexy, Dr. W. S. Kirkes found the kidneys decidedly diseased in 14; and in 12 of these there was coincident disease also of the heart and cerebral vessels. (*Med. Times and Gaz.*, Nov. 1855, p. 515.) These cases certainly prove a close relation between the several morbid conditions referred to, either as the results of one common cause, or as exercising a causative agency among themselves. The probability is that all three conditions often result from a general morbid state of the system not well understood; but it is also highly probable, as before stated, that the disease of the kidneys acts injuriously both on the brain and heart, by rendering the blood impure, and that the heart when diseased co-operates with the kidneys in increasing the cerebral affection.*

It is a highly interesting question, what is the state of the brain which gives it a tendency to apoplectic effusion. There can be little doubt that organic changes in the *coats of the blood-vessels*, such, for example, as ossification, and atheromatous deposits, or fatty degeneration, may so far lessen their power of resistance as to lead to rupture upon the application of any unusual force. Hence, perhaps, in part, the peculiar liability of old people to the disease. An aneurismal state of the cerebral vessels has been occasionally observed, and it is possible that this may sometimes be the cause of rupture, even when it escapes observation.† The opinion appears to me very plausible, which ascribes the occurrence of apoplexy, in the greater number of cases, to a previous disease of the cerebral *substance*, predisposing it to hemorrhage. This opinion is ably supported by Rochoux, who considers hemorrhagic apoplexy, with effusion into the substance of the brain, as dependent in almost all cases upon a peculiar previous softening of the cerebral substance. Such a softening is almost always observed around the collection of blood; according to Rochoux, in ninety-nine out of one hundred cases. (*Ranking's Half-Yearly Abstract*, i. 204.) This softening he believes to be peculiar, and not dependent upon inflammation. It is true that other observers, as Cruveilhier, Carswell, and Durand-Fardel, consider the softening as consequent upon the hemorrhage, and not antecedent to it. It is asked, why the attack of apoplexy is so seldom preceded by signs of cerebral disease, if so serious an organic change has been going on in the substance of the brain? But this objection is met by the fact, that such changes have frequently existed in organs without any obvious signs during life, and have been first revealed by dissection. Besides, there often are preliminary symptoms of a marked character; and it appears to me that the theory of M. Rochoux affords the best explanation of their occurrence. Admitting the previous existence, in many instances, of this hemorrhagic softening, we have been, until of late, completely in the dark as to its nature and immediate cause. But some observations of Mr. Paget, communicated to the *London Medical Gazette* in February, 1850 (*page* 229), render it in the highest degree probable that, in many cases of apoplexy with cerebral softening, the previous condition of the brain is connected with, if it be not dependent on a fatty degeneration of the minute cerebral vessels. In such cases, even in the apparently healthy parts, minute particles of oil may be detected by the aid of the microscope, scattered in the substance of the vascular coats; while, in the diseased part, the vessels are so beset with them that the healthy structure becomes wasted, and at length completely lost, so that the vessel ruptures with great facility, and of course permits hemorrhagic effusion. But then comes the question, as to the cause of this fatty degeneration. The reader will find this question sufficiently answered in the remarks already made on the various origin and character of cerebral softening. (See *Cerebritis*, p. 718, and *Non-inflammatory softening of the brain*, p. 738.)

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* In a report of 42 cases by Dr. A. Eulenburg, there was an abnormal condition of the arteries at the base of the brain in 29, and hypertrophy of the left ventricle in 9. Of the 29 cases of vascular disease mentioned, 17 were attended with signs of endocarditis, 19 with disease of the valves, and 6 with hypertrophy of the left ventricle. Hence it is inferred that disease of the cerebral vessels is a more frequent cause of apoplexy than hypertrophy of the heart. (*Am. Journ. of Med. Sci.*, April, 1868, p. 479.)

Of 36 fatal cases at St. George's Hospital. London, reported by Mr. Jones, there was conjoint disease of the cerebral vessels, other vessels, the heart, and the kidneys in 19; of the cerebral vessels, heart, and kidneys in 22; of the heart and kidneys in 29; of the cerebral vessels and kidneys, in 22; of the cerebral vessels and heart in 24. In the absence of all these conditions, the attack of apoplexy is to be ascribed generally to accident. The author thinks that disease of the kidneys is most frequently the original fountain of the evil. (*Med. T. & Gaz.*, Feb. 1863, p. 174.) Too much importance, however, must not be attached to these lesions, considered either as immediate or predisposing causes of apoplexy. Very often they are mere coincidences, and have little to do with the disease, except as occasionally results of the same general cause. It is probable that a very large proportion of old persons would exhibit one or more of these lesions after death; and as apoplexy attacks the old in much the larger proportion, it will of course be found connected with these post-mortem appearances in a greater or less degree. (*Note to the sixth edition.*)

† *Aneurism in the Brain.* An essay on this subject has been published, by Dr. Wm Gull, in *Guy's Hospital Reports* (A.D. 1859, p. 281), from which it would appear, that aneurism of the cerebral arteries is a more frequent source of apoplexy than was formerly supposed. It is sometimes difficult to detect the lesion after death, and it has probably often escaped discovery in post-mortem examinations. According to Dr. Gull, when young persons die of "ingravescent" apoplexy, and copious effusion of blood is found, especially if it be upon the surface of the brain, within the tissue of the pia mater, the existence of an aneurism is probable. Though the disease is most common in the larger arteries at the base of the brain, or in the fissures between the lobes, yet the smaller branches are sometimes affected, even after penetrating the cerebral substance. Of 62 cases, collected by Dr. Brinton and himself, 28 were in the vertebral arteries and their branches, and 34 in the carotids and their branches; and of the former 20 were in the basilar, and

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The *immediate* or *exciting causes* of the apoplectic seizure are very numerous. It must be admitted that the attack not unfrequently occurs as the result of previous disease of the brain or its vessels, without any obvious exciting cause. Thus, it often happens that the patient is attacked while sitting, standing, or quietly walking, without the least unusual physical effort, and without any mental excitement or disturbance. Indeed, instances are not uncommon in which the seizure takes place during sleep. But in other instances, and those very numerous, the result can be clearly traced to some

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of the latter 15 in the middle cerebral; so that these two arteries are beyond comparison the most frequent seat of the disease. This form of apoplexy is much more common in early life than the ordinary form. Of 58 cases in which the age is given, 12 were under 25 years, 18 between 25 and 40, 29 between 40 and 60, and only 4 over 60. The youngest was 14. The preponderance of the young is even greater than it seems; for, in the more advanced, death was frequently owing to other coincident cerebral affections, among which the aneurism was of comparatively little account. There does not appear to be any symptom or series of symptoms, by which the disease can be diagnosticated during life. Dr. Gull has given, in the essay above referred to, a table of the symptoms in 12 cases, which may be consulted by those desirous of prosecuting inquiries on this subject. (*Note to the sixth edition.*)

direct cause. Whatever is capable of increasing the force of the circulation, and especially of giving it a peculiar direction to the brain, and whatever impedes the return of blood from that organ, and thus produces congestion of its veins and sinuses, may act as the immediate cause of apoplexy. It is probable that such causes alone, without any peculiar predisposition, may produce the simple congestive form of the disease. It is even possible that they may occasion hemorrhage by transudation into the cavity of the arachnoid and ventricles, in a previously sound state of the brain. It is by no means certain that they may not also occasion rupture of healthy cerebral vessels, in the substance of the brain, when operating with peculiar violence. But the circumstance that apoplexy so seldom occurs in the young, who are even more exposed than the aged to these exciting causes, proves conclusively that, without aid from other influences, they are seldom alone adequate to the production of the disease. Among the causes alluded to may be enumerated, 1. strong muscular effort, as lifting heavy burdens, violent coughing or sneezing, straining at stool, the act of vomiting, playing upon wind instruments, excessive exertion of the voice, and the act of coition; 2. any position favouring the accumulation of blood in the brain, as stooping, suspension by the feet, and turning the head strongly in a direction differing from that of the body, so as to compress the jugulars; 3. compression of the neck by tight cravats or other ligatures, and general compression of the trunk; 4. external stimulation immediately to the head, as by the direct rays of a hot sun, and the heat of an intense fire; 5. internal stimulation directed especially to the brain, as by violent emotion, and the use of alcohol or other cerebral stimulant; 6. increased force of the general circulation, from hypertrophy of the left ventricle, indulgences of the table, the hot bath, &c.; 7. transfer of morbid action, from repelled eruptions, retrocedent gout or rheumatism, the healing of old ulcers, the suppression of accustomed discharges; and 8. organic or other affections impeding the return of blood from the head, including tumours pressing on the jugular veins, diseases of the heart, congestion of the lungs, &c. Excessive cold is said also to produce apoplexy, probably by concentrating the blood in the interior organs.

Nature.—The definition of apoplexy given in this work implies that the essence of the disease is a sudden pressure upon the brain. The pressure is produced by an active or passive congestion of the cerebral vessels, by effusion of serum, or by hemorrhage. Active congestion may be the result of an irritation in the brain, inviting, or of an exterior force, compelling, an undue quantity of blood into the organ. Passive congestion is produced by whatever prevents the return of blood from the head. In the former, it is the arteries which are loaded; in the latter, the veins and sinuses. The effusion of serum may be the consequence of obstruction of the veins by tumours, &c., of a general dropsical disposition in which the cerebral membranes may participate, or of a vascular irritation or inflammation of the meninges. Hemorrhage may be the result either of transudation, or of rupture of the vessels. The former may perhaps be the case, in general, when the blood flows primarily into the cavities, the latter when it collects within the substance of the brain.

It has been questioned whether the brain is capable of being compressed. Observation has decided the question in the affirmative. In cerebral hypertrophy, the organ after death expands considerably upon the opening of the cranium and dura mater, proving that it was previously in a state of compression. But, even allowing the essential incompressibility of the cerebral substance, there is little difficulty in explaining, to a certain extent, the effects of pressure in producing the symptoms of apoplexy. Every action of the brain, or any portion of it, requires a certain amount of arterial blood, either as a stimulus, or as furnishing materials essential to the action. If the supply of fresh blood be unduly diminished, the actions also languish or cease. The brain can no longer perform its duty of receiving impressions, transmitting motive power, or generating thought. Palsy of sensation and voluntary motion, and the loss of consciousness are necessary results; and these are the symptoms of apoplexy. But in what manner is the supply of blood to the acting cerebral substance diminished in this disease? In the first place, in active congestion, as more blood is invited or forced into the arteries than legitimately belongs to them, the increased space thus occupied must be gained at the expense of all compressible spaces; and the veins must therefore receive less, and consequently convey back the blood more slowly than in health. A stagnation in the capillaries is a necessary consequence, and the blood in them, soon becoming changed, can no longer afford the essential stimulus or material. In passive congestion, on the contrary, the gain by the veins must be supplied at the expense of the arteries, which are compressed, and less blood enters the capillaries than is essential to the due support of the cerebral functions. In serous and sanguineous effusion, it is obvious that the space occupied by the liquid is abstracted from that of the veins and arteries conjointly, and there is a consequent deficiency of the pabulum essential to action in the nervous centres.

The above course of reasoning explains the phenomena so far as the centres are concerned. It is probable also that the apoplectic symptoms may arise, in part, from an interruption of the communication between the nervous centres and the external parts under their control. The connecting cords may be so compressed that influence is but imperfectly conveyed along them in either direction, or they may be ruptured, as in effusion of blood into the cerebral substance, and their function cease altogether. In the former case, there may be imperfect sensation and imperfect motion; in the latter, there must be a total want of both, so far as regards the particular part to which the communicating fibrils that have been ruptured run. Nor is it difficult to account, in the same way, for the absence of sensation alone in some cases, and of motion in others. All that is necessary to be supposed is, that the nervous cord which conveys impressions to the nervous centre is ruptured or compressed in the former cases, and that which carries the motor impulse in the latter. That respiration continues, during the deficiency of the other functions, must arise from the fact, that the centre which governs that function is less liable than the sensorial centres to the effects of the compression within the cranium. Lying near the great outlet of the cavity, it probably participates partly in the security of the nervous structure without the enclosure. Should the medulla oblongata be the immediate seat of the compression, life may cease immediately from the cessation of breathing; and this is probably the case, in some instances of sudden death, and in some of those in which great prostration is experienced at the commencement, with coldness of the surface, feebleness of pulse, and a failing respiration.

Diagnosis.—Is it possible to distinguish the varieties of apoplexy, dependent upon difference in the compressing cause; or to determine the portion of the brain occupied by the effused blood, when that is the source of the phenomena? I believe not with any certainty or precision. Occasionally, however, we may reach very probable conclusions. When the attack speedily subsides, without producing palsy, or at least without leaving any paralytic phenomena behind it, and without any of those mental deficiencies which indicate a structural lesion of the brain, we may infer that it was congestive; and, whether active or passive, might be determined in some instances by the nature of the cause, and in most, with some degree of probability, by the symptoms which ordinarily distinguish the two conditions elsewhere; as a full strong pulse with a red flushing of the face, in the active, and a comparatively weak or natural pulse, and a livid hue of the countenance, in the passive. But it would be going too far, to say that no case could be one of mere congestion in which a paralytic effect remained, or that the affection must be necessarily congestive when unaccompanied with palsy. It is well known that congestion alone may produce palsy; and it is possible that the paralytic effect may continue for some time after the cause of it has ceased; just as the palsy of an arm produced by pressure upon the nerve, often outlasts considerably the compressing cause. It is, moreover, not at all impossible that hemorrhage may exist without producing observable paralysis.

It was formerly supposed that the existence of *serous apoplexy* was indicated by paleness of the face and feebleness of the pulse. Experience, however, has proved this notion to have been a fallacy. It is, indeed, impossible to diagnosticate these cases with an approach to certainty. When the attack supervenes upon chronic disease of the brain, or accompanies an obvious dropsical diathesis, or is marked by the occurrence of general instead of local or partial palsy, it may be suspected to be of this nature.

Hemorrhagic apoplexy may be diagnosticated when hemiplegia precedes the seizure, and generally, when this or any other form of palsy is left behind, after the apoplectic symptoms have disappeared. Should palsy of all the limbs result, the inference would be that the effusion of blood had been great. When, after a partial or complete loss of consciousness, the patient recovers, and soon afterwards becomes comatose with the ordinary symptoms of apoplexy, the case may almost always be regarded as hemorrhagic.

In relation to the seat of the effusion, inferrible from the symptoms, all that can be said with an approach to certainty is, that hemiplegia or partial palsy upon one side of the body indicates the existence of hemorrhage upon the opposite side of the brain; and this is true, also, as a general rule, when the cerebellum is the seat of the hemorrhage, although the fibres of that structure do not, like those of the cerebrum, decussate before passing out of the cranium. More will be said upon this point under the head of palsy. A connection has also been observed between apoplexy of the cerebellum and disorder in the sexual appetite; so that any unusual exaltation of this propensity, or striking loss of it, immediately before the apoplectic seizure, might lead to the suspicion that the cerebellum was the seat of the disease.*

* Hemorrhage in the cerebellum is attended with many of the ordinary phenomena of apoplexy; but, according to M. Coquerel, it presents certain diagnostic characters, by which it may be distinguished, with considerable certainty, from cerebral apoplexy. From a careful examination and comparison of many cases, he has drawn the following conclusions. The attack may be gradual or sudden. In the former case, consciousness is not lost; in the latter, though in very rare instances lost for a short time, it generally returns. In the most violent cases, death is sometimes instantaneous, which is not the case in the cerebral disease. Another distinguishing character is vomiting, which is frequent and scarcely restrainable, while in ordinary apoplexy it is rare. In some cases of hemorrhage in the cerebellum, there is profound coma before death; but, on the occurrence of the attack, the patient evinces by cries and movement that he is sensible. There is usually inability to stand; but the patient has some power over his limbs, which he can raise from the bed, and hold for a time in that position. Hemiplegia occurs only in about one-third of the cases. The paralysis is always on the side opposite to the effusion. A tendency to a recoiling or rotatory motion was observed only in one case. *Paralysis* of the face and tongue, so common in cerebral apoplexy, is very rare in this; yet there is a peculiar expression, as it were of astonishment, with fixedness of the eyes; which, however, does not continue long. General and special sensibility usually remain unaffected. There are no convulsions, unless other portions of the nervous system are involved. The mean duration of the affection, omitting the cases of sudden death, is a day and a half. The termination is generally in death, though the disease is not insusceptible of cure. (*Arch. Gén.*, Mai, 1858, p. 565.)—*Note to the fifth edition.*

For diagnostic characters of diseases of the cerebellum, based on the most recent physiological and clinical experiments and observations, the reader is referred to a note on page 721 of the present volume. The remarks there made apply as well to hemorrhage of the cerebellum, as to inflammation, tumours, softening, &c. (*Note to the sixth edition.*)

The diagnosis between apoplexy and *coma occurring from other causes* is not always easy. When the insensibility has occurred suddenly, and is attended with a flushed and turgid face, a full, strong and slow pulse, and a slow, stertorous breathing, the probabilities are strongly in favour of apoplexy; and the probability is converted into certainty by the simultaneous occurrence of hemiplegia, or palsy of any one portion of the body. But cases of apoplexy are not always marked by these symptoms. Sometimes stertor is absent, the face is pale, and the pulse feeble and perhaps frequent. Even in such a case the existence of palsy would go far to decide the question. But even this diagnostic character may be wanting; or the palsy may have pre-existed. Under such circumstances, the decision must be based upon the history of the case, and upon the absence of characters indicating the existence of other kinds of coma. For the diagnostic characters of these affections, the reader is referred to *Functional Disease of the Brain, Epilepsy, Hysteria, Meningitis*, and *Cerebritis*. There are, however, two or three conditions, which may with propriety be particularly noticed in this place.

The coma produced by narcotic poisons, particularly such of them as may be denominated cerebral stimulants, sometimes closely resembles apoplexy. Profound intoxication from alcohol, and still more, perhaps, the stupor from opium, strongly simulate that disease. To distinguish them, the circumstances under which they occurred should be ascertained, if possible; whether, for example, the patient had been drinking spirituous liquors, or had been in a situation in which he might be supposed to have been drinking; whether an empty laudanum bottle was to be found upon his person, or in his vicinity; whether any cause for the commission of suicide existed, &c. &c. The smell of the breath will often serve as a diagnostic character. The absence of palsy in any one portion of the body; the general capability of being somewhat roused in the earlier stages of narcotic poisoning; the extreme dilatation of the pupil from certain narcotics, as stramonium and belladonna; the gradual progress of the symptoms, from a state of more or less excitement, to drowsiness, stupor, and ultimately coma; these circumstances, when existing, should have their weight in influencing the decision. When apoplexy may have been induced by alcoholic drinks, the case becomes more complicated, and, at a certain point in the affection, it might be impossible, in the absence of palsy, to decide the question. In the last stage of narcotic poisoning, when the coma is profound, the pulse has given way, and the general relaxation of the muscles is complete, the diagnosis must be based exclusively on pre-existing and attendant circumstances; and here the age of the patient would be of much assistance. In a young person, the presumption would be in favour of some other affection than apoplexy. The poisoning from irrespirable gases or vapours is generally known from the circumstances of its occurrence. In these cases, the pulse is apt to be weak, the surface cool, and the face, though it may be coloured, is rather livid than reddened.

The effects produced upon the brain by an accumulation of urea and of bilious matter in the blood, sometimes bear a close resemblance to apoplexy; and, indeed, the suggestion has been advanced, that most of the cases of nervous apoplexy, as they have been called, might be referred to the existence of Bright's disease of the kidneys. Two cases of this kind are recorded by Dr. J. A. Wilson. (See *Dict. de Méd.*, iii. 458.) The gradual progress of the symptoms, the general absence of palsy, the suppression or great diminution of the renal secretion, with the presence of albumen in the urine, the existence of jaundice or of white or clay-coloured stools, would be sufficiently diagnostic. It is quite evident that the disease differs wholly from apoplexy as here defined. The one depends upon a poison accumulated in the blood, the other upon pressure on the brain.

Perhaps the affection most difficult to be distinguished from apoplexy is the coma of chronic cerebritis, or of cerebral softening whether inflammatory or not. The difficulty of decision, in these cases, arises chiefly from the association of partial palsy with both affections. But the preliminary symptoms in cerebritis, especially the paroxysmal headache with vomiting, and the complication of the paralysis with rigid contraction of the flexor muscles of the extremities, will generally serve to distinguish it. In acute cases, the diagnosis is more difficult, and must rest chiefly on the greater tendency to muscular rigidity in the cerebral inflammation. Not unfrequently, the two affections are associated; apoplexy either supervening upon softening, or giving rise to it after the effusion of blood has taken place.

Prognosis.—Apoplexy is a very serious disease, though very often not immediately fatal. The cases consisting of congestion solely almost always recover under proper treatment. The patient may, indeed, survive numerous attacks of this form of apoplexy; but there is always danger that a congestive stroke may be followed by one of a hemorrhagic character; and when this danger is escaped, the disease, as already stated, is apt to leave traces behind it in an enfeebled condition of the memory and intellect.

The hemorrhagic and serous forms of apoplexy are much more fatal. Rochoux thinks that less than one-third of the number attacked perish from the immediate effects of the blow. Among the signs which threaten an unfavourable issue, are convulsions, general paralysis, deep coma lasting two or three days, a gradual onset of the disease ending in profound coma and paralysis, complete immobility of the pupil, inability to swallow, flapping of the cheeks in respiration, foaming at the mouth, frequent yawning or sighing, repeated vomiting, involuntary evacuations, a frequent and irregular pulse, cold extremities, cold and clammy sweats, and a failure of the circulation succeeding great strength of pulsation, without any amendment in the other symptoms. The patient may survive the occurrence of any one of these phenomena; but they must always be regarded as dangerous signs; and, when several of them are presented in the same case, the hope of a cure is feeble. In judging of the probable result, reference must be had to the number of previous attacks, and to the age of the patient. The prognosis is more unfavourable in the old than in the young, and, upon the whole, in proportion to the age. A second attack is more apt to be fatal than the first; and a third than the second. Favourable signs are the absence of those above mentioned, and a general subsidence of the symptoms. In relation to the ultimate result, the prognosis is, on the whole, unfavourable. The individual once attacked with hemorrhagic apoplexy, if he escape for the time, is very apt to die, in the end, either of a subsequent attack, or of a general failure of the vital functions, consequent upon the mischief done to the brain.

Treatment.—The indications of treatment are to check the hemorrhage, or reduce the congestion, to prevent a renewal of either affection, to obviate inflammation, and to promote the absorption of blood or serum that may have been effused. The same measures are calculated to meet most of these indications. The patient should be placed in a recumbent position, with his head and shoulders somewhat elevated by pillows; everything which acts as a ligature should be removed from the neck and chest; and the air of the chamber should be rather cool, and frequently renewed. Persons not concerned in the treatment should be removed from the apartment.

If the strength of the pulse admit, blood should be drawn immediately from the arm, through a large orifice, and to an extent proportionate to the vigour of the patient and the force of the circulation. But bleeding is not to be indiscriminately resorted to, or pushed to an unlimited extent. Much injury has probably been done in this disease by excessive bleeding. It is not, in the first place, inflammation that is to be subdued, but merely hemorrhage or congestion. The object of bleeding is not now so much to alter the character of the blood, as to check the current of it towards the head. If nature has already accomplished this purpose by a great reduction of the heart's impulse; if the pulse at the wrist, instead of being full and strong, as it generally is, should be small and feeble, there is no advantage to be derived from the further loss of blood at the commencement of the treatment. It should be remembered that, in the hemorrhagic and serous cases, the disease is not over when the effusion is suppressed. The brain has sustained a great shock, and a long series of actions in the organ will be necessary to repair the mischief done. It is a bad practice to destroy the resources of the system, which may be necessary to sustain this course of action, by an inconsiderate and exclusive obedience to the first indication; that, namely, of arresting effusion or correcting congestion. I would repeat, that the practitioner should be guided by the strength of the pulse whether he shall bleed or not; and by this, in connection with the general strength of the constitution, to what extent he shall bleed. From fifteen to thirty ounces may be taken from a robust patient at the first bleeding, should the pulse bear the loss well. But the operation should be checked as soon as the circulation shows evident signs of having slackened in force. The bleeding may sometimes be performed a second, third, or even fourth time, should the vigour of the pulse continue; the quantity taken being diminished each time. Allowance must be made for the pulse of hypertrophy of the left ventricle, which is sometimes full and strong almost to the last moment of existence. Very often a single bleeding will be found amply sufficient.

After the circulation has been sufficiently reduced by general bleeding, and without that remedy should the pulse be feeble at the commencement, blood may be taken locally, by cups or leeches, from the temples or the back of the neck. From the great relief sometimes afforded to cerebral congestion by a moderate epistaxis, there would seem to be a propriety in applying some leeches to the interior of the nostrils. This situation for local depletion would be especially indicated, if the attack should have succeeded a suppressed epistaxis. When the apoplectic attack has followed the suppression of hemorrhage from the rectum or uterus, or of the menses, leeches should be applied to the anus or vulva. As the later bleedings are generally attended with the appearance of the buffy coat, signifying the existence of some inflammation in the brain, probably induced by the presence of the clot of blood, the local bleeding is especially indicated at this stage of the disease. Some authors have recommended emetics in apoplexy, and most continue to recommend them in cases which may have followed a full meal. I think that, in genuine hemorrhagic apoplexy, they can never be otherwise than injurious. If any one who may have vomited severely, will call to mind the feeling of intense distension in the temples, and general cerebral fulness, of which he has been sensible during the act, he would dread the thought of putting the vessels of the brain upon such a stretch, when already pouring out blood, or but just recovered from the hemorrhagic act. It seems to me that it could scarcely otherwise happen than that injury should result. If the stomach has been filled, it will gradually empty itself, even though the contents may be alcoholic; and, in the mean time, we have it in our power, by means of the lancet, rest, position, &c., to control the force of the excited circulation. In those cases of coma from sympathetic irritation, which sometimes follow the use of indigestible food, and which are anything but apoplectic, an emetic is often of great service; but never probably in true apoplexy; at least never with sufficient certainty to justify the hazard. Should the patient spontaneously vomit, or be affected with retching, it may be proper to facilitate the process, and calm the stomach by free dilution with mild liquids; but this very seldom happens in genuine cerebral apoplexy. The late Dr. Jos. Parrish used to mention to his pupils the case of a young man who died of apoplexy, induced by the action of an emetic; and Andral relates a case, in which vomiting was obviously followed by a renewed attack, in a patient already apoplectic.

Purging is very useful in apoplexy. It acts not only by depleting, but also by a powerful revulsion from the head, along the whole track of the alimentary canal. Active purgatives should be used at first. If the patient is able to swallow without much difficulty, the infusion of senna with sulphate of magnesia is probably the best cathartic that can be given. When there is reason to think that portal congestion or torpidity of the liver is associated with the attack, a full purgative dose of calomel should be administered, and followed by castor oil or Epsom salt. If there is difficulty of deglutition, croton oil may be administered in the dose of a drop every hour or two till it operates. Sometimes it will be found the best plan to put a drop of this medicine upon the back part of the tongue, and allow it to remain until it excites the movement of deglutition. Should the throat be so far paralyzed that the patient cannot swallow, strong infusion of senna, or some other active cathartic should be given by enema.

When the patient can swallow, if the indications continue for depressing the cerebral circulation, bromide of potassium, which is asserted to have a remarkable power of reducing vascular action in the brain, would seem to be indicated; though I cannot recommend it on the ground of my own experience.

In ordinary cases, cold should be applied to the head by means of cloths wet with iced water, or of bladders or water-proof bags filled with small pieces of ice. (See *Meningitis*, p. 711.) But if the surface is cool, the face pale, and the pulse feeble, this remedy is contraindicated. Under these latter circumstances, some recommend warm emollient applications.

Dr. John Chapman recommends the application of water at 120° F., contained in a bag, over the cervical and upper dorsal vertebræ, with the view of contracting the capillaries by stimulating the sympathetic centres. He states that in twenty minutes he has seen the head become much cooler under this application. The bag is to be continued, with the water at the same temperature, as long as the head is hotter than natural. At the same time, he advises the application of the ice-bag to the lower dorsal and lumbar region for three-quarters of an hour, to be reapplied after some hours; with the object, I presume, of expanding the capillaries, and increasing heat in the lower part of the body. (*Med. T. and Gaz.*, May, 1865, p. 464.)

Revulsion to the extremities should be kept up by the occasional use of hot stimulating pediluvia, sinapisms, &c.

When the force of the circulation has been sufficiently reduced by the above measures, and the comatose symptoms continue at the end of three or four days, the head should be shaved, and the whole scalp covered with a blister. A powerful exterior revulsion is thus effected, and any tendency to inflammation of the meninges strongly counteracted.

Lastly, should the disease not yield to these measures, the effect of a mercurial impression should be tried. If unsuccessful, it can do no harm; if successfully brought about, it may prove useful in counteracting inflammation, and promoting the absorption of the effused blood, two of the indications above referred to. A very sore mouth, or profuse salivation should not be aimed at. A mercurial pill, or a grain of calomel may be given every two or three hours, and the operation assisted by gentle mercurial friction upon the inside of the thighs and arms. Mercury is peculiarly indicated in those cases in which a syphilitic origin may be suspected; and, in the same cases, iodide of potassium would probably prove highly efficacious.

In the cases with depressed circulation, pale and cold surface, and collapsed rather than turgid countenance, should the debility not be in itself alarming, it may be proper to take some blood locally by cups or leeches from the temples or back of the neck, or to make a small tentative bleeding from the arm. If, by the loss of a little blood, the pulse should acquire increased fulness and strength, it would be proper to proceed further; if, on the contrary, it should become somewhat more depressed, all thought of direct depletion should be abandoned, and the treatment should be confined to moderate purgation, revulsion towards the extremities, and to the surface of the scalp, and a gentle mercurial impression. Sometimes the debility approaches to syncope, and imperiously demands the employment of supporting measures. In such cases, an injection of oil of turpentine may be thrown into the rectum, blisters and rubefacients applied to the skin, and, if these should not sufficiently excite the circulation, carbonate of ammonia, arnica, capsicum, oil of turpentine, &c. may be given by the mouth; care being taken to avoid stimulants disposed to act immediately upon the brain, such as the fermented or distilled liquors, unless under circumstances of the strongest urgency.

During the treatment, attention should be paid to the bladder, and the urine drawn off regularly if requisite by the catheter. Upon the restoration of consciousness, the greatest care should be taken to avoid all disturbances whether moral or physical. The diet should be of the lowest kind in the early stages, consisting of farinaceous or demulcent drinks, when the patient can swallow. As the case advances, it should be improved, and, in convalescence, the milder forms of animal food may be allowed in great moderation, such as milk, a soft-boiled egg daily, boiled fowl or mutton, &c., in connection with vegetable substances. All premature efforts on the part of the patient should be sedulously guarded against. In the prostrate cases, it may be necessary to give animal broths even at an early period.

Should paralytic symptoms succeed those of apoplexy, the treatment must be conducted upon the plan recommended under the head of palsy.

Prophylactic Treatment.—This is of great importance in apoplexy. After one attack, the patient should be considered as peculiarly prone to the disease, and put upon his guard at all points. His bowels should be kept regularly open once a day; and, if any tendency to constipation exist, he should take occasionally a small dose of sulphate of magnesia, or some other saline cathartic. Should vertigo or headache, with a flushed face, and a strong full pulse, come on at any time, no hesitation should exist in employing the lancet, or in taking blood locally from the head, or in the use of an active purge, according to the urgency of the symptoms. Care, however, should be taken not to confound merely nervous sensations from disordered digestion, hysterical tendencies, or other cause, with those resulting from sanguineous congestion.

All the causes of the disease should be most carefully avoided. The diet of the patient should consist chiefly of vegetable food and milk, with the lighter meats, especially boiled meats, in moderation. Stimulating drinks and condiments should be wholly proscribed. Even tea and coffee, if used at all, should be taken weak and in small quantities; and black tea should be preferred. The object should be to avoid plethora on the one hand, and anæmia, which provokes excessive action of the heart and disposes to cerebral softening, on the other. The patient should take moderate exercise, particularly of the passive kind; but should avoid all active muscular exertion, should never strain under any circumstances, even at stool, should never walk fast, or run, or mount a flight of stairs hastily. He should always sleep with the head elevated, and, though taking care to keep sufficiently warm at night, should avoid the other extreme of excessive heat. In warm weather, a mattress should be preferred to a feather bed. In the use of the bath, care should be taken that it be not heated above 98°. The hot bath produces often almost as powerful an impression on the brain as wine. The cold bath should also be used with caution. Though the patient might often employ it with impunity and even advantage to his general health, yet there is always the risk that the blood may be too suddenly concentrated in the brain. Nor is less caution necessary in watching over his mental condition. It should be the care of the patient's life to maintain an equable frame of mind, and never to allow himself to be excited into passion or strong emotion by any of the varying interests, or conflicts, or vexations of this world. Severe intellectual occupation, also, if previously the habit of the patient, should be abandoned for the remainder of life. In short, it should be his aim, and that of his medical adviser, to maintain in all things, in eating, drinking, exercise, employment, pleasure, and pursuits of every kind, as well as in the state of the bodily functions, a wholesome moderation.

Article IV.

FUNCTIONAL DISEASES OF THE BRAIN.

THERE are two points of view from which functional disease of the brain may be regarded; *first*, in relation to the pathological state of the organ; *secondly*, in relation to certain symptoms or groups of symptoms, which, though in some instances they have the rank of diseases, are in fact only the effects of the true disease, and the signs by which it is made known. It will contribute to a clearer understanding of the subject, to consider it in both these lights.

Before entering upon the special affections, there is one preliminary consideration which it is necessary to present to the student. A remarkable fact, familiar to all pathologists, is, that similar phenomena very often proceed from precisely opposite conditions of the brain; so that it is occasionally very difficult to decide, from the symptoms alone, what is its real pathological state. To some pathologists this fact seems so difficult to be reconciled to a sound philosophy, that they have endeavoured, in the seemingly opposite states of the part, to discover some one action or influence of an identical character, to which the effects may be ascribed. Such an influence is supposed to have been found in pressure on the brain, which is said to be produced when the condition of the cerebral circulation is in any way disturbed. Thus, if too much blood is sent into the arteries, pressure upon the cerebral substance in their vicinity is the necessary result. If too little is sent, then, as the cranium is a plenum, always kept full by the pressure of the atmosphere, there must be a corresponding excess in the veins, so that pressure is exerted in their neighbourhood. But this explanation is unsatisfactory. In the first place, it does not meet those cases in which the blood is altered in quality only, nor those in which the morbid phenomena are purely nervous without any vascular change; and, in the second place, assumes, as the result of pressure, symptoms which are very different from such as are known to proceed from that cause. Thus, stupor is well known to be produced by pressure; but I am not aware that morbid vigilance has ever been shown to be among its effects.

But this peculiarity of cerebral disorder is really not so anomalous as at first sight it may seem to be. The phenomena of electricity, analogous, in various respects, to those of nervous action, are not less so in the present case. We obtain effects, to ordinary observation precisely the same, from positive and negative electricity. Both produce attraction and repulsion, the electric spark, the shock, and chemical decomposition. It is not surprising, therefore, that the brain, which is the great nervous battery, should exhibit similar effects from precisely opposite conditions. It is true that science can detect a difference between the effects of positive and negative electricity. It is highly probable that a similar difference will some time be detected also in the seemingly identical results of opposite cerebral disturbance. As it is, we can often, by a close observation, discover peculiarities which enable us to determine, with sufficient certainty, the particular pathological condition in which the phenomena, in any special case, may have originated. I do not wish it to be inferred that I believe the brain to act in the same manner as a galvanic battery. My object is simply to show that, in the apparent contradiction, there is in fact nothing opposed to the course of nature in other departments, and consequently nothing impossible, or really contradictory.

I. PATHOLOGICAL CONDITIONS.

These may be included under the divisions of 1. pure nervous irritation, without any necessary participation of the blood-vessels; 2. vascular irritation, or active congestion; 3. depression, whether nervous or vascular; and 4. mechanical or passive congestion.

1. Nervous Irritation.—The brain is peculiarly susceptible to irritation of an essentially nervous character; that is, without necessary participation of the blood-vessels. Too exclusive an importance has, I think, been attached to the state of the circulation in this organ. All the morbid phenomena have been ascribed by some pathologists to too much or too little blood, or to its unequal quality or distribution. These are undoubtedly frequent sources of cerebral disorder; but the brain is also frequently excited into disease without them. The nervous system has a mode of action of its own, in which, though blood may be necessary as an instrument, it is not the main operating principle. This action is susceptible of exaltation, depression, or depravation in itself, and from the influence of its own peculiar agents. The fact here stated is not of merely speculative interest. It is in the highest degree practically important; and a vast deal of mischief has been done by looking to the blood-vessels exclusively as the seat or source of cerebral disorder. But, in thus asserting for the nervous functions a capacity of exclusive and independent disease, we must not forget that their irritation frequently, in the end, involves the blood-vessels; and that the affection, if not relieved, may terminate in active congestion or inflammation.

Symptoms.—As the offices of the brain are numerous, so also must be the signs of its excessive excitation. To enumerate all these in the present place would be quite out of the question. Irritation in the brain obeys the general laws of that morbid affection. If moderate, it exalts the healthy functions without otherwise altering them; if stronger, it more or less deranges the functions; in great excess, it entirely changes or abolishes them. Thus, sensation and perception may be simply rendered more acute: or they may be deranged, producing vertigo, pain, and every variety of disorder in vision, hearing, touch, &c., from buzzing in the ears, unnatural colouring of objects, a sense of tingling, formication, &c., to complete hallucination. The intellectual faculties and the emotions may be excited into increased vigour, or may be completely perverted, as in delirium and insanity. The general overseeing faculty of the brain may be simply stimulated to increased vigilance, to a more ready and rapid response to all the intimations of its dependent functions; or it may be thrown into excessive disorder, evinced by restlessness, jactitation, obstinate sleeplessness, &c. The motor faculty may merely impart increased activity and energy to the muscles under the influence of the will; or it may throw off more or less completely subordination to that principle, and give rise to every variety of spasm and convulsion. Finally, all the functions above referred to may be overwhelmed by an excess of the irritation, and more or less completely lost in stupor, coma, and paralysis.

Not only the proper cerebral functions become deranged in this species of irritation, but to a certain extent, also, many, I might perhaps say, all those of organic life. Connected with the digestive function we often have nausea and vomiting; with the secretory, disorder of the liver and kidneys; with the respiratory, hurried and otherwise irregular breathing; with the circulatory, a frequent and agitated, though seldom full or energetic pulse.

Various special diseases either consist exclusively in some modification of cerebral nervous irritation, or frequently partake of that affection. Such, among others, are insanity, epilepsy, chorea, neuralgia, and hysteria. Frequently, also, it is met with at the threshold of other diseases, in which the morbid action consists mainly in vascular irritation or inflammation. It exists, moreover, very often in its milder grades, without receiving any other name than the vague one of nervous disorder.

Causes.—The nervous temperament, great mobility of the nervous system, as in children and females, and debility or poverty of the blood predispose to this form of disease. Causes which, in a vigorous frame, might induce vascular irritation, are apt in debility to excite only the nervous. Anæmia operates especially as a predisposing cause. When the blood is not rich enough to supply the wants of the system, the cerebral centres receive intimation of the deficiency from every function, in order that the due influence may be transmitted to the heart, and are kept in a constant state of excitement, which itself often amounts to irritation, or readily becomes so by the addition of any new stimulus.

The exciting causes are excessive intellectual action, violent emotion, strong impressions from without upon the senses, and almost every variety of local irritation elsewhere, especially in the gums, the stomach, the bowels, and the uterus. The headache accruing from acid in the stomach, the delirium sometimes excited by excessive pain, the insanity from hepatic disease, the coma of uterine affections, and the convulsions from intestinal spasm in infants are often examples of this kind.

It is important, in reference to treatment, to make a correct diagnosis between purely nervous and vascular irritation of the brain; but the distinguishing characters will be most conveniently given under the following head.

Treatment.—It is only the general principles of treatment that can be given in this place. The indications are, 1. to remove the cause of irritation, whether predisposing or exciting; 2. to diminish the susceptibility, or directly to repress the excitement of the cerebral centres; and 3. to equalize the nervous action, either by medicines calculated to stimulate the whole nervous system, or by revulsive impressions upon other parts of the body.

To meet the first indication, the patient must be protected as far as possible from exterior sources of irritation; and a close scrutiny into the state of all the organs must be instituted, in order that any existing disease in any portion of the system may be corrected. As a debilitated and anemic condition of system predisposes to the complaint, such a condition, if present, should be removed by the chalybeates and other tonics, exercise, pure air, and a nourishing diet.

The second indication is to be fulfilled by opium and other nar
extract of hemp, hyoscyamus, belladonna, stramonium
roform, tobacco, digitalis, and hydrocyanic acid; the
comparison, being opium in some one or other of
ration. When the cause is temporary, this

in the brain, already detailed as the effect of nervous irritation, may equally result from the vascular. Among the most common are a sense of fulness, weight, or distension in the head; giddiness; headache of every grade and variety; increased sensitiveness to sound, with buzzing, roaring, and other perversions of hearing; double, partial, luminous, painful, dim, or otherwise disordered vision, with muscæ volitantes, scintillations, &c.; tingling, formication, neuralgic pains, numbness, and partial or complete loss of sensation in various parts of the body; nausea and vomiting; morbid vigilance, or perhaps more frequently oppression, heaviness, drowsiness, and stupor in various degrees; mental confusion, loss of memory, and delirium; and finally subsultus, spasm, convulsions, or the opposite condition, indicated by muscular weakness, tremors, and temporary paralysis of motion. It is, of course, understood that all these symptoms are not present in any one case. They are, indeed, often contradictory, and could not exist together. There may be one only, or a few, or many variously grouped.

Active congestion of the brain is sometimes of itself serious, and may prove fatal; but its greatest danger is as the precursor of inflammation of the brain or its membranes, or of apoplectic effusion. Another injurious result, common to this and the preceding variety of cerebral disorder, is the establishment in the brain, under frequently renewed irritations, of a habit which may lead to the recurrence of the phenomena from slight causes, and even, in some instances, without any apparent exciting causes, as in epilepsy, some forms of hysteria, chronic headache, &c. It is a condition which requires attention; and by the proper management of which, at an early period, much subsequent suffering and danger may be prevented.

Causes.—All the causes enumerated under the last head may produce vascular irritation, when the system is predisposed to it; and, as before stated, it is very apt to be the result of the continuance of an irritation primarily purely nervous. But there are certain causes more especially operative, such as direct injury to the head by falls, blows, &c., exposure of the head to intense solar or artificial heat, external cold, alcoholic stimulants, the exciting passions, febrile diseases, translated gouty or rheumatic irritations, suppressed discharges, teething in children, hypertrophy of the left ventricle, and various intestinal and stomachic disorders. The sanguineous temperament, a plethoric state of the circulation, and an over-richness of the blood may be considered as constituting predispositions to it. Men are probably more subject to it than women. It is common in infancy, at the age of puberty, and from that up to maturity, and again in advanced life.

Diagnosis.—It is sometimes highly important to distinguish active congestion of the brain from passive congestion, depression, or mere nervous irritation. In relation to the two former of these affections, the reader is referred to the subsequent part of this article. From nervous irritation it is to be distinguished chiefly by the state of the circulation. In active congestion, the face is usually flushed, the eyes suffused, and the whole countenance often turgid. If the patient is sensible, he is apt to complain of fulness, distension, or heaviness of the head; and any vertigo or headache which he may have is much increased by stooping, with the head downward. The temporal and carotid arteries sometimes may be seen to throb. These symptoms are often wanting in purely nervous irritation. The state of the pulse, too, is different. In the former condition it may be small or large, accelerated or slow, but it is almost always in a greater or less degree tense, hard, and strong. In the latter, it may be natural as to frequency, or very much excited, but is generally rather feeble, or at least destitute of tension. In nervous irritation there is often an aspect of a lighter, more fugitive affection, sinking less deeply into the sources of life, which an experienced eye can readily detect

In congestion, when considerable, there is more tendency to drowsiness or stupor; the expression of countenance is duller, or more changed; and the case appears to approach nearer to the character of inflammation or cerebral hemorrhage.

Treatment.—The treatment in this affection, independently of the measures necessary for the removal of the cause, which should never be neglected, is chiefly depletory, sedative to the circulation, and revulsive. Bleeding, general and local, purging, the warm bath, the antimonials when the stomach is not irritable, other saline refrigerants, bromide of potassium, cold to the head and hot pediluvia, mustard, blisters, &c. to the extremities, with low diet, rest, and an elevated position of the head, are the principal remedies. Very often, in mild cases, the symptoms may be removed by a saline cathartic and attention to the diet. When serious, however, recourse should be had to the lancet. The internal use of aconite has been highly recommended; and American hellebore would prove still more effective. It must be remembered that, though the warm bath may be useful, the hot bath might prove injurious by over-stimulation. Yet the application of heated water over the lower cervical and upper dorsal vertebræ ought to prove serviceable, by exciting the sympathetic centres, and thereby promoting contraction in the cerebral vessels. But no permanent benefit can be expected while the offending cause remains. This, therefore, should be diligently sought for, and removed or corrected if possible.

3. Depression.—In this condition, the activity of the brain is diminished either by a directly depressing influence, or the withdrawing of an accustomed stimulus.

The symptoms, so far as regards the disorder of sensation, consciousness, mental action, and motive power, are the same as those already mentioned as resulting from irritation of the brain. We have the same headache, vertigo, disordered vision and hearing, wakefulness, delirium, convulsions, and coma. There is not, as from the moderate influence of the other affection, increased cerebral energy, as indicated by greater acuteness of sensation, more brilliancy of imagination, a more rapid flow of just thought and expression. These can result only from a positive excitement of the brain; but all the other derangements alluded to may be experienced. It may seem strange that obstinate wakefulness and violent convulsion should be among the effects of cerebral depression; yet few facts in medicine appear to me to be better established. Thus, take away from the brain a stimulus to which it has been long accustomed, and one of the first results is morbid vigilance; and this condition is a not unfrequent attendant on the debility which succeeds exhausting acute diseases. The last vital act of the system, expiring under the loss of blood, is sometimes convulsions. It is well known that all the phenomena of advanced meningeal inflammation, or acute hydrocephalus, are sometimes imitated in children in the lowest stages of exhaustion from bowel affections; and the brain is found apparently healthy after death. The insanity which attends starvation might be adduced as another illustration of the resemblance between the phenomena of an excited and depressed brain; but it is probable that, in this case, there is a real and powerful irritation of the cerebral centres, proceeding from the impressions sent up to them so urgently from all parts of the suffering system.

After death from cerebral depression, especially in cases of chronic debility, serous effusion has sometimes been observed in the cavities of the brain, and has been misinterpreted into an evidence of inflammation; especially as softening of the cerebral substance has been at the same time observed, resulting from the imbibition of the serum and a sort of maceration, or possibly from some directly depressing influence. The presence of the effused fluid is nothing more than what might reasonably have been anticipated from the preexisting condition. The brain is not sufficiently nourished, or not sufficiently supplied with blood, and, as the cranium does not admit of a vacuum, the loss of bulk is supplied by effusion of watery fluid from the blood-vessels.

The *causes* of cerebral depression are long-continued or excessive cold; the depressing passions, such as fear and grief; various sedative poisons, as tobacco, digitalis, hydrocyanic acid, and chloroform; the irrespirable gases, as hydrosulphuric acid, carbonic acid, carburetted hydrogen, &c.; deficiency in the general amount of blood, or in its supply to the brain; an impoverished state of the blood; an excess of carbonaceous matter, and the presence of urea and bilious matter in the blood; the withdrawing of an accustomed stimulus; and, secondarily, any excessive excitement when it ceases. Of course, all the modes of living, the kinds of exposure, the accidents, the diseases which produce any of the above conditions, may act as remote causes of cerebral depression. To enumerate them here would be only to occupy space with what is already familiar to the reader.

An important point is to discriminate between depression and vascular irritation of the brain. The greatest practical evils have resulted from error upon this point. Bleeding has often been resorted to in diseases of pure debility, because convulsions, or delirium, or insanity, or morbid vigilance, or some other symptom occurring in cerebral exaltation, has been misinterpreted into a necessary sign of that condition of the brain. The diagnosis is not always easy. But we can generally reach a tolerably just conclusion, by taking into consideration the cause of the affection, and the signs exhibited by the organic functions. When, for example, the effect can be clearly traced to a directly sedative agent, or to the withdrawal of a direct stimulus, or to an obviously debilitated condition of the system; when, at the same time, the pulse, though perhaps frequent, is less firm and strong than in health, the face pale, livid, or purplish, the capillary circulation slow, and the patient disposed to faintness upon exertion, there can scarcely be a doubt upon the subject. The aggravation of the symptoms upon rising from a stooping to an erect position is another valuable diagnostic sign. The difficulty is that, in cases of debility, an active congestion of the brain is sometimes induced by an irritant cause, and exhibits itself by cerebral symptoms similar to those of depression. But the nature of the cause will often enable us to decide justly; and a permanent flushing of the face, or other signs indicative of a steady determination of blood to the head, would very much aid the diagnosis. Another difficulty is sometimes presented by cases, in which a sudden and powerful irritant influence has overwhelmed the brain, and so far cramped its energies as to have induced a prostrate condition of the organic functions. A blow upon the head, an astounding piece of intelligence, the shock of a severe accident or surgical operation, or excessive pain in some structure especially rich in sympathies, as the stomach, bowels, kidneys, &c., occasionally produces such a result. Here too we are aided by a knowledge of the nature of the cause; and, whenever there is good reason to suspect the existence of the condition of things alluded to, we should act cautiously in the application of stimulant measures, from the fear of subsequent reaction.

Inflammation of the brain itself, or apoplectic congestion or effusion, by interfering with the ordinary influences of the organ, sometimes induces the same apparent signs of debility; but the previous symptoms and attendant circumstances will generally sufficiently evince the nature of the case.

Treatment.—Tonics, the different classes of stimulants, external irritants, and a nutritious diet, with the means necessary to remove the causes of the affection, are indicated in this condition of the brain. In cases at all doubtful, those stimulants should be preferred which have the least permanent impression upon the brain, such as carbonate of ammonia, oil of turpentine, capsicum, musk, and assafetida; while external stimulation by means of rubefacients, blisters, the hot bath, &c., and the powerful influence of electro-magnetism, should be mainly relied on, when deemed sufficient to meet the exigencies of the case. Should the respiration have been suspended, it should be restored artificially. This is especially important in the cases of poisoning from irrespirable gases. The shock of cold water suddenly dashed upon the surface is sometimes very effective, by rousing the suspended sensibilities of the brain.

4. Mechanical or Passive Congestion.—This results from causes interfering with the return of blood from the cerebral vessels. The blood accumulates in the veins and sinuses; the capacity of the arteries is of course diminished; less arterial blood is admitted than is necessary for the support of the functions; and we have the double result of compression and depression of the brain.

The characteristic symptoms of this condition are a feeling of fulness, weight, and sometimes coldness in the head, an actual diminution of temperature in this part, a strong tendency to drowsiness or stupor, vertigo, faintness, impaired vision with muscæ volitantes, forgetfulness of things or words, dulness of countenance, a livid or purplish hue of the lips and different parts of the face, with paleness, occasionally nausea, and depression in the functions of circulation and respiration.

The causes are ligatures around the neck, tumours pressing upon the venous trunks, gravitation, and such an organic or functional derangement of the heart and lungs, as to impede the passage of the blood either into the right side of the heart, or from the right to the left side through the lungs, and consequently to produce accumulation in the descending cava.

The treatment consists exclusively in the removal of the cause, and, when this is impossible, in the adoption of measures calculated to proportion, as nearly as may be, the calls of the system upon the cerebral centres to their diminished capacity. The avoidance of all kinds of excess, mental or physical, is especially requisite.

II. MORBID PHENOMENA.

I do not propose to treat, in this place, of all the phenomena of functional disease of the brain. Most of them have been already, or will be hereafter fully considered, in connection with special diseases, either consisting essentially of this kind of derangement, or associated with it. But there are certain phenomena, which, though noticed elsewhere, and perhaps in various places, yet have not been presented so fully or so connectedly to the reader as their importance would seem to require; and others which, not essentially connected with any other special complaint, and scarcely meriting the rank of distinct diseases themselves, yet demand some attention, and may be most conveniently noticed under this heading. The phenomena, or affections alluded to, may be included in the divisions of 1. sensorial disorder; 2. mental disorder; and 3. disorder in the motor power.

1. *Sensorial Disorder.*

This may embrace all the cerebral derangements having reference to sensation and consciousness; and the morbid conditions which claim attention in this place may be arranged under the sub-heads of headache, stupor, and wakefulness.

1. Headache, or Cephalalgia.—In the widest acceptation, this may be considered as embracing all kinds of uneasy sensation in the head. Very often it is wholly independent of the brain, being seated in the scalp or cranium. Such is the case with many instances of gouty or rheumatic headache, neuralgia, various inflammatory affections of the exterior coverings of the cranium or of its sinuses, and syphilitic affections of the periosteum or bony case itself. These do not belong to the complaint as here considered, which is exclusively cerebral.

Headache is of every degree, and of every conceivable diversity of character. It may be confined to one small spot, in which case it is sometimes called *clavus*, as if it might proceed from a nail driven into the head; it may occupy a particular region of the cranium, as the frontal immediately over one or both eyes, the temporal, the parietal, or the occipital; it may embrace one side of the head as in *hemicrania;* or it may be diffused, and of indefinite extent. Sometimes it is fixed, sometimes changeable in its position. It may be apparently superficial, or felt in the depths of the brain. It is not less various in duration than in the other respects mentioned. It may continue but for an instant, or may last for hours, days, or weeks. Indeed, instances have occurred in which it has never been absent, during consciousness, for months or years. Much more frequently, however, when so durable, it occurs in paroxysms with intervals of comparative or entire ease, the exacerbations being quite irregular in their recurrence. Not unfrequently, however, headache is regularly periodical, being either remittent or intermittent, and generally of the quotidian or tertian type, though the interval is sometimes longer, and I have known it to occur regularly once in two weeks, without association with any natural periodical function. The pain may be simple, or may be mingled with various other perverted sensations, such as giddiness, fulness or distension, weight or lightness, emptiness, heat or coldness, hissing, buzzing, ringing or roaring in the ears, the sight of dark or luminous spots, scintillations, double vision, half-vision, dimness of vision, and temporary blindness.

Headache may be the result of any one of the pathological conditions described in the beginning of this article, and is one of the most common of their effects. It appears to be the favourite sign by which nature makes known any deviation whatever from the normal state of the brain. Viewed in this light, it may be looked on as a safeguard, intended to give notice of disease which might otherwise escape attention till too late to be remedied; and its indications should never be neglected. The physician, consulted for this affection, should not be content till he has traced it to its source, however hidden; for it is not the pain only that he is called on to relieve, but often the more serious affection of which it is a mere symptom.

For the sake of convenience, we may consider headache as *symptomatic* when the result of some known disease, and *idiopathic* when the pathological state on which it may depend cannot be ascertained, or is not recognized among special diseases. It is obviously nothing more, strictly speaking, than a symptom in either case.

Symptomatic headache is exceedingly common, and associated with a great number of diseases. It is an almost uniform attendant on the different forms of meningeal and cerebral inflammation; and is usually the first sign by which other organic affections of the brain, such as tumours, hydatids, and morbid growths or formations of all kinds, declare themselves. As the direct result of vascular irritation of the brain, it is one of the most common symptoms of all febrile diseases, whether idiopathic or symptomatic, and is a not unfrequent precursor of apoplexy and epileptic convulsions. Gout and rheumatism often show themselves in this guise. In the nervous form, it is very often sympathetic of disease of the stomach, constituting *sick headache*, of hepatic disease, constituting *bilious headache*, of worms, constipation, and other disorders of the bowels, of renal and uterine affections, and of spinal irritation. It is sometimes dependent on decayed teeth, even when these do not ache. In every obstinate case of cephalalgia, of uncertain origin, particular examination should be made into the condition of the teeth, and, if any one of these be found decayed and tender on pressure, it should be extracted. I once had a case of headache, which had continued for two or three months, with varying degrees of violence, and had resisted numerous remedies, which yielded immediately upon the extraction of some decayed teeth. Diseases of the heart are very frequently, and those of the lungs somewhat less frequently, attended with headache, dependent either on the greater impulse with which the blood is sent into the brain, as in hypertrophy of the left ventricle, upon the insufficient supply of blood, as in pure dilatation and softening of the heart, mitral regurgitation, &c., or upon venous congestion consequent on impediment, either pulmonary or cardiac, to the passage of the blood from the venous to the arterial system. Anæmia and plethora are also affections which frequently occasion headache, though from opposite causes.

Idiopathic headache is also not uncommon. It is usually distinguished by the name of *nervous headache*. It is exceedingly irregular in its modes of attack, duration, and recurrence, as well as in the character of the pain. Sometimes coming on suddenly in a state of apparently sound health, it prostrates at once the mental as well as physical energies of the patient, and, after a longer or shorter period, leaves him as abruptly as it approached, and with all his powers restored. In other instances, it comes on slowly, heralded perhaps by unaccountable depression of spirits, or acerbity of temper, and gradually increases for hours, perhaps for days, before it attains its acme and declines. In one patient, an attack is experienced at long intervals; in another, the pain returns frequently and quite irregularly; in a third, it is scarcely ever absent entirely for long periods of time; at least the individual never feels himself secure against it for a moment. Sometimes it interrupts and prevents sleep; but more frequently the patient, though tormented during the day, will go to sleep at the usual hour, and upon awaking find that the pain has left him for a time. More frequently than any other variety of headache, this assumes the regular periodical form. In most instances, probably, the pain is in the front of the head, over one or both eyes; but it is occasionally felt in the occiput, and is often diffused without a definite seat. Not unfrequently it occurs in the form of *hemicrania*. It may be dull and grumbling, or heavy and throbbing, or sharp and lancinating like neuralgia. After continuing a certain length of time, it not unfrequently provokes vomiting; but differs from sick headache in the circumstance, that the matter discharged from the stomach may be quite destitute of acid, bile, or any acrid property. Its duration is entirely uncertain. One attack seldom continues long; but the patient is liable to frequent returns of it, in many instances for months or years, and in some even for life. It is purely functional, and leaves no traces in the brain after death. The headache itself never proves fatal; but it may, in the end, so far wear out the strength as to render the system less able to support the assaults of other diseases, and may thus contribute to shorten life.

The causes of it are often obscure. One of the most common is, I believe, the use of coffee, tobacco, and strong tea. Sedentary habits, combined with much mental exertion and loss of sleep, sometimes give rise to it, independently of any primary disease of stomach. It may now and then be traced to a disordered state of the blood, consequent upon defective renal, hepatic, or cutaneous secretion, upon the absorption of unwholesome matters from the alimentary canal, or upon some concealed vice in the processes of assimilation. Occasionally I have observed the breath to smell offensively. It has appeared to me that, in many instances, this variety of headache is nothing more than a form of nervous gout and rheumatism.

Treatment.—For the treatment of symptomatic headache, the reader is referred to the various diseases of which it is an accompaniment. Under the heads of *nervous gout*, *sick headache*, and *neuralgia*, he will find remedies for varieties of the disease in its nervous form. The treatment adapted especially to *hemicrania* is detailed under the last-named affection. It is only for the disease in its idiopathic form that the mode of treatment is here given.

The first and most important point is to discover and remove the cause. In the first place, if the patient is in the habit of using either strong tea, coffee, or tobacco habitually, he should be advised to try the effect of abandoning it for three or four weeks, by way of experiment. Very often he will find the headache relieved by this simple measure, and then will be sensible of the propriety of abstaining from the poison altogether. Should this measure fail, it will be necessary to seek for some other cause, and if there is any one suspicious article of diet, the same course should be pursued with that as with the substances mentioned. The patient should also sleep sufficiently and regularly, should not overtask his mind or allow himself to be worried and perplexed by business or other cause, and should exercise freely in a pure air. If a citizen, he should be advised to take a journey into the country. A long voyage is occasionally very useful. Sometimes a complete change of life, the substitution, for example, of the business of farming for that of a merchant or professional man in cities, has a most salutary effect. It need scarcely be added that the bowels should be kept regular, and the functions of the stomach, liver, kidneys, skin, and uterus, in a healthy state.

The pain may almost always be temporarily relieved by opiates or other narcotics; and sometimes, when it is very severe, it becomes advisable to have recourse to these remedies; though their habitual use should be most carefully guarded against. The nervous stimulants or antispasmodics also frequently afford relief. One of the best of these is Hoffmann's anodyne, of which a fluidrachm may be given; but, on the whole, I have found nothing more effectual than two or three cups of strong tea or coffee. When the disease depends upon the use of tea or coffee, this remedy acts simply like ardent spirit in relieving the horrors of intemperance. It should, under these circumstances, not be employed, as it aggravates the evil in the end. But in other cases it will be found a valuable resource. Ether applied in the hollow of the hand to the forehead, chloroform rubbed upon the scalp and then confined by a piece of oiled silk, lotions with spirit of lavender, Cologne water, or bay-rum, the application of a mustard plaster to the back of the neck or the temples, or blisters behind the ears, and the external use of tincture of aconite, are sometimes advantageous. The taking of several deep inspirations in quick succession is said occasionally to afford relief. It was suggested by M. Tavignot, under the impression that the affliction might in some instances be connected with a stasis of blood in the cerebral sinuses, or insufficient change in the lungs. (See *Am. Journ. of Med. Sci.*, N. S., xxi. 201.)

In relation to the permanent cure, sulphate of quinia should always be employed in intermittent cases, and may be tried with the hope of good in others. In connection with digitalis, it is supposed to be still more efficacious; and the combination, given at night, in moderate doses, for at least three months, though at first increasing the pain, has effected cures in very obstinate cases. (*Lancet*, July, 1864, p. 66.) When there is any suspicion of gout or rheumatism, recourse should be had to occasional purgative doses of sulphate of magnesia and wine of colchicum, to which a full dose of sulphate of morphia may sometimes be added. The chalybeates should be used in anemic cases. In certain extremely obstinate cases, especially if paroxysmal, arsenic proves wonderfully efficacious. A patient of mine, who had been for many months a martyr to the disease, in whom quinia, iodine, mercury pushed to salivation, and other powerful remedies, including depletion, had been employed in vain, began to improve immediately under the use of Fowler's solution, and was effectually cured in two or three weeks. According to Dr. A. Barallier, the most efficacious re-

medy in nervous headache is hydrochlorate of ammonia, given in three doses of about 15 grains each, at half an hour's interval, dissolved in mint-water sweetened with syrup of orange-flowers. The pain is relieved by the first dose, and disappears with the second or third. It is not at the beginning, when the affection is still slight, that the remedy is so efficacious; but only when given while it is at its height. (*Ed. Med. Journ.*, Aug. 1859, p. 173.) If the disease prove obstinate, the whole round of remedies recommended in neuralgia is at the command of the physician.*

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* *Aphasia* (Trousseau).—*Aphemia* (Broca).—*Alallia.*—*Amnesia verborum.* I do not know where, better than in this place, to consider the peculiar phase of cerebral disorder, which has been variously designated by the above names. It is an affection which, though long known to medical writers, has recently attracted special attention, and formed the subject of several interesting essays. Of the names at the head of this note, the first three signify, by their derivation, an inability to speak, the last a forgetfulness of words; and, together, they sufficiently define the affection; which consists essentially in a loss of the faculty of speech, depending on the loss of memory for words. It is altogether different from the dumbness dependent on mental disorder, or a paralytic condition of the tongue or larynx. Indeed, among the characters which ought to enter into the definition, is that both the mental intelligence, and the organs as well of phonation as of articulation may be perfectly normal. Generally the patient can utter one or a few words, which are usually monosyllabic, and which he uses on all occasions whenever he wishes to convey his meaning, without any reference to their applicability. Sometimes the articulate sound has no meaning whatever, as in the examples of *tan*, *af*, and *savona*, which are mentioned as having been used in particular instances. The word or syllable uttered is most commonly some one in familiar use, as *yes* or *no;* or of an energetic character, as an oath or exclamation; and is spoken with an apparent effort, and often repeated in quick succession, as yes, yes; no, no, &c. Occasionally it is some short familiar sentence that is used instead of a single word; as *how do you do*, *go to bed*, &c., without any regard to the meaning. The ideas of the patient may be perfectly clear, and often he strives to make himself understood by adding gestures to his small vocabulary, and shows impatience when he cannot succeed. The characters here given may be considered as essential; but there are many diversities, to some of which it is necessary to call attention. In many instances, though the patient can of himself utter either nothing, or only such articulate sounds as have been referred to, he can readily speak after another person, repeating the words without difficulty. He can also frequently write what he wishes to say, and read with an apparently perfect appreciation of the language. Sometimes, too, it is asserted that he can sing or count when he cannot speak. A case now and then occurs, in which the patient can speak when under excitement, but is mute in his ordinary condition. There are, moreover, instances in which the affection is changeable; better, for example, on certain days or times of day, and after a short time recovering; while in others it is unalterable, and permanent for years, or for life. There are mild cases, in which the forgetfulness extends only to certain classes of words; as to the names of persons or places, the patient's own name being forgotten; or to the names of things generally, the other parts of speech being remembered. The patient, under these circumstances, makes use of circumlocution to express his thoughts; as, when, being unable to remember the word *scissors*, he substitutes the expression "*what we cut with.*" Aphasia is seldom a solitary affection; being very generally connected with other evidences of cerebral disease, especially hemiplegia, which, in some degree, is present in the great majority of cases. Besides this, there are not unfrequently tonic spasms, convulsions, and disorders to a greater or less extent of the sensitive and mental functions.

History. The loss of memory for words long since engaged the attention of medical writers. Gesner and Crichton published memoirs upon it, towards the close of the last and beginning of the present century. M. Bouillaud was the first after Crichton to prosecute inquiries into this subject. Beginning in 1825, he afterward published many cases, and finally reached the conclusion, that the affection is connected with a constant lesion of the anterior lobes of the brain, which he considered as the seat of a special function, presiding over the power of speech or articulate language. Many observations were afterwards published, some supporting, and others opposing the views of M. Bouillaud. A step in advance was made, in 1836, by Dr. Marc Dax, of Sommières, who, in a memoir presented at a congress in Montpellier, maintained, as the result of an examination of a very large number of reported cases, that the faculty of speech resides exclusively in the *left* side of the brain, which is of course the seat of the lesion in these cases. M. Broca, of Paris, who was ignorant of the researches of M. Dax, and was originally doubtful as to the soundness of M. Bouillaud's views, was induced to pay special

2. Stupor and Wakefulness.—These opposite conditions are mentioned here, not with a view to minute description, but chiefly in order to call

attention to the subject by having accidentally under his care, in one of the hospitals of Paris, two cases, in which this defect of language was very strikingly displayed. After the death of one of the patients, he found a mass of disease in the brain and its membranes; but, especially, a cavity as large as a hen's egg, filled with serum, occupying a position in the left and anterior part of the brain, and separating the frontal convolutions from the parietal. This cavity had been formed by the destruction of the brain-substance, in consequence of previous softening. Among the parts destroyed was the posterior half of the second and third frontal convolutions, and M. Broca had no doubt that this was the original seat of the lesion. In the second case, which had presented similar phenomena during life, there was found, after death, a smaller cavity occupying the very centre of the position held by the larger cavity in the previous case. The only essential difference, except in extent, seemed to be, that the cavity in the second case exhibited undoubted evidences of hemorrhagic origin. The prominent circumstances in Broca's cases were that the loss of speech and of memory for words was almost absolute; while the intelligence was undisturbed, and the *organs* of articulation and phonation perfect. The faculty of articulated language was almost entirely destroyed. Believing that he had demonstrated the existence of a special affection, dependent on a special lesion in the brain, he proposed the name of *aphemia* for the former (α, priv., and φημι, I speak), as expressive of its character; and announced the second and third convolutions of the anterior *lobe* of the *left* hemisphere as the seat of the latter. This announcement was received with great hesitation, as it contradicted all preconceived notions in relation to the duality of the cerebral functions. Very singularly, however, of the many cases which were for some time afterwards published, almost all those in which a post-mortem examination was made, not less than 15 in number, were confirmatory of the results of Broca, not only as to the precise seat of the lesion in the second or third convolution, but also as to its position exclusively on the left side.

Cases, however, were afterwards published which tended to invalidate these conclusions. In some, destructive disease was found in the supposed seat of the lesion, without any disorder whatever of speech; in one or more cases, the lesion was found in the right side; and, in one at least, it was asserted to have occurred in the occipital lobe. M. Trousseau made numerous observations on the subject, and came to conclusions not in accordance with those either of Bouillaud or of Broca, as to the precise seat of the disease. It was he who proposed the name of *aphasia* (from α, and φασι, they speak) for the affection, as being more in accordance with correct classical usage. So late, however, as 1865, M. Bouillaud asserted his continued adherence to his original views; stating that, "as observations sufficiently numerous and well considered have demonstrated that the lesions of the special faculty of speech have place constantly in the anterior lobes, and that the faculty remains unchanged when the lesions of the brain occupy exclusively the two other lobes, it follows necessarily that the faculty exists in the anterior lobes. All the opposing observations have been discussed and weighed, and none of them unite the conditions which a well-made observation demands." (*Arch. Gén.*, Juin, 1865, p. 741.) It would not be proper to leave the history of this subject, without referring to an excellent essay published by Dr. Jules Falret in the *Archives Générales*, (March, 1864, and subsequently), to which I have pleasure in acknowledging my indebtedness in preparing this sketch; to an essay by Dr. J. T. Banks in the *Dublin Quarterly* for February, 1865; and to another by Dr. J. Hughlings Jackson, of London, translated and published in the *Archives* for March, 1865, to both of which I am also indebted for some of the preceding statements. Dr. Jackson's paper consists chiefly of a narrative of a large number of cases of aphasia, generally connected with hemiplegia, in which out of 28, the hemiplegia was on the right side in 20, and on the left in only 8. Now as the cerebral lesion is universally admitted to be on the side opposite to the hemiplegia, it follows that the aphasia was connected with disease on the left side of the brain, in a very large proportion of cases.

Causes. Softening of the brain appears to be the cause of aphasia in almost all instances; and the origin of the softening has been traced, with considerable probability, in many cases at least, to obstruction, either by thrombosis or embolia, of the cerebral arteries supplying the seat of the lesion; so that when an apoplectic or simply hemiplegic attack is attended with aphasia, there is good reason to ascribe the affection to softening, and, if at the same time disease of the heart or great vessels exists, to refer the softening to vascular disease.

Nature. The reader has been put in possession, in the history of the disease above given, of all the facts which have any important bearing on the affection. It appears to me that, occurring as it does in almost all cases, in connection with various other important phenomena, and not yet traced with certainty to a precise and distinctive lesion, it attention particularly to the fact, that they may each of them be the result of a depression or elevation of the cerebral actions.

By *stupor* is meant that condition of the brain which consists in a suspension more or less complete of the animal functions, while those of the organic life continue, and which bears a close resemblance to sleep, except in the circumstances that it is much less under the control of the will, and depends upon some morbific cause. Under the name may be included various grades of the affection, from heaviness or slight drowsiness to absolute *coma*, in which all consciousness is lost, and from which the patient cannot be roused. It may be produced at any time by pressure upon the brain, whether proceeding from vital causes congesting the cerebral vessels, or giving rise to effusion within the cranium; or from mechanical causes, as depression of the bone, or impediment to a return. of the blood from the head. Some appear to consider it as dependent upon pressure alone. But, as this cause operates merely by suspending certain functions, there is no reason why stupor, in its different grades, should not arise from other causes capable of interrupting the same functions, whether by an excess of excitement or a direct sedative impression. I have no doubt whatever, that it often results from both these causes, altogether independently of pressure. Thus, I have seen coma consequent upon a sympathetic irritation extended to the brain from the stomach loaded with indigestible matter, when the face was quite pale, the pulse was wholly undisturbed, and there was no reason whatever to suspect congestion within the cranium. I have seen it, moreover, result apparently from the loss of blood, and consequent simple depression of the cerebral functions. A boy fell upon his head from a great height, and was affected immediately with symptoms of concussion, for which he was at the moment improperly bled. His system, however, reacted, and along with the reaction the coma with which he was originally affected began to give way. The excitement was thought to exceed the just limits, and leeches were applied to the temples. Immediately afterwards the coma increased; and it now became a question, whether this could be owing to an increased excitement of the vessels augmenting the pressure, or might be the result of an insufficient supply of blood to the brain. The weakened pulse, the paleness of face, and the diminished heat induced his attendants to ascribe it to the latter cause. They administered stimulants and nutriment, and from the moment this plan was commenced, the child began to recover. He would probably have perished under other circumstances, and almost certainly had the bleeding been repeated. The practitioner, therefore, must be upon his guard in cases of coma, and prepared to treat it upon the principle either of morbid pressure, of simple excess of irritation, or of depression. As the result of the last-mentioned cause, it frequently follows the influence of sedative narcotic poisons, such as tobacco, digitalis, or hydrocyanic acid, or the admission of venous or carbonized blood into the arteries of the brain. Coma in children, with largely dilated pupils, and not ascribable to any obvious cause, may be conjecturally referred to narcotic poison, and, under circumstances favouring that supposition, may be treated with a

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scarcely deserves to rank in the category of diseases, and must yet be considered merely in the light of a symptom. The most curious circumstance in connection with it is its extraordinary tendency to associate itself with lesions of the left and anterior side of the brain; for, although the proof of the essential existence of a special lesion in any one spot can hardly be considered as conclusive, yet the weight of evidence is quite irresistible upon the point referred to. To explain this preference, in the present state of our knowledge, is quite impossible; yet the discovery of the fact may be of considerable importance in the further prosecution of inquiries into the pathology of the brain.

As to the *treatment* of this affection, no new facts have yet been developed. The case in which it occurs will be managed in accordance with the existing state of system, and the presumed state of the cerebral affection, with little reference to the existence of the defect of language. (*Note to the sixth edition.*)

gentle emetic. The late Dr. Dorsey was called to a child in this state, and saved his life by giving an emetic, which brought away a large quantity of stramonium seeds. Among the most efficacious means of relieving coma, when all the indications for correcting the special state of the brain, whether connected with excessive or deficient action, and for removing the cause as far as possible have been fulfilled, is the injection into the bowels of an infusion of green tea, a decoction of coffee, or a solution of caffein.

Wakefulness, morbid vigilance, or *insomnia*, certainly proceeds, in many instances, from an over-excitement of the brain, whether merely nervous, or vascular. Thus, it is a frequent incident in the early stages of meningeal inflammation and insanity. It is well known, also, to be produced in many persons by coffee and tea, which powerfully stimulate the nervous system, with little effect upon the vascular; and is a common attendant upon the excitement of joy, hope, or anticipation. It appears to be a lower grade of that vascular excitement, which, carried further, ends in stupor.

Very commonly a depression of the vascular actions of the brain, or a purely nervous depression, produces some grade of stupor; but occasionally it may also give rise to morbid vigilance; and this I consider an important practical fact. We see it, as already observed, and as will hereafter be fully shown, proceeding from the suspension of the use of powerful stimulants (see *Delirium Tremens*); and it is a frequent result of great general debility, without being at all traceable to any irritant cause. What are the peculiar circumstances which determine these opposite effects, as the consequences of apparently the same pathological condition, has not been determined. That the seeming anomaly is not without analogies in nature, has been already shown. (See pp. 764–5.) The student should be prepared to refer the symptom, when he may encounter it, to the true cause, whether of irritation or depression. His view upon the point will determine his practice.

The remedies, whether for stupor or wakefulness, are to be addressed to the pathological condition, whatever that may be, and will be found detailed elsewhere. It has been stated above, that coffee and tea may often be advantageously used as powerful antihypnotics; and bromide of potassium has recently obtained considerable reputation for producing sleep.*

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* Very different opinions have been entertained in relation to the cause of sleep: some believing it to result from the pressure of blood within the cerebral vessels, and thus to be the effect of a kind of congestion of the brain; others, on the contrary, referring it to a diminution of the quantity of blood contained in the brain in the waking state. The advocates of the former opinion adduce in its favor the fact that coma is the constant result of pressure of the brain; and that, by varying the degree of pressure, every degree of this phenomenon may be induced, from a very moderate stupor scarcely distinguishable from natural drowsiness or sleep, to profound insensibility, from which the patient cannot be roused. But they who oppose this opinion deny altogether the analogy between coma, which is purely morbid, and sleep, which is a perfectly healthy function; and adduce certain experiments to prove that the brain, in proper sleep, contains in fact less blood than in the waking state. Such experiments have been made by Mr. Arthur E. Durham (*Guy's Hosp. Rep.*, 1860, p. 149), and by Dr. Wm. A. Hammond (*N. Y. Med. Journ.*, May, 1865, p. 89), who, by removing a portion of the skull in the lower animals, could observe the condition of the brain, as to its greater or less fulness of blood, in different states. The uniform result, in such cases, was that the brain appeared somewhat collapsed, and the redness and other evidence of vascular fulness diminished, in healthy sleep; and similar inferences were drawn from various observations in the human subject, in which the brain from accident or surgical operation was more or less exposed. But, admitting fully the accuracy of the facts adduced, I do not think the inference drawn from them is exempt from objection. As it is admitted, on all hands, that the functions of the brain are much less actively exercised in sleep than in the waking state, it does not require the support of experiment to prove, that less blood passes through the brain in a given time in sleep. In fact, it cannot be otherwise, if we admit that it is through the supply of blood that the functions are performed, and that the less active are the functions, the less is the amount of blood furnished. But, though less blood may

2. *Mental Disorder.*

To this head belong delirium, insanity, and certain less usual forms of derangement, of which those especially deserving of notice appear to be ecstacy and somnambulism. *Delirium* in its different forms and relations has been or will be sufficiently treated of elsewhere. Being always a symptom, it has been considered, in its general relations, under the head of *Symptomatology* (vol. i. *page* 212), and specially, in connection with the diseases which it attends, such as the different forms of fever, and of cerebral inflammation. One affection in which it constitutes a prominent character, namely, *delirium tremens*, will be treated of distinctly; and there will be occasion to refer to it also in connection with other nervous affections which are yet to be considered. *Insanity* forms the subject of a distinct article. It remains, then, in this place, only to notice the two disorders above alluded to under the names of *ecstacy* and *somnambulism*. These are curious mixtures of sensorial and intellectual disturbance, which approach more nearly to delirium or insanity than to any other form of cerebral disease.

1. Ecstacy.—This is an affection in which, with a loss of consciousness of existing circumstances, and insensibility to impressions from without, there is an apparent exaltation of the intellectual or emotional functions, as if the individual were raised into a different nature, or different sphere of existence. The patient appears wrapped up in some engrossing thought or feeling, with an expression upon his countenance as of lofty contemplation, or ineffable delight. Voluntary motion is usually suspended; and the patient either lies insensible to external influences, or, as in catalepsy, maintains the position in which he may have been attacked. Sometimes, however, the muscles obey the will, and the patient speaks or acts in accordance with his existing impulses. In these cases, the disease borders closely on somnambulism. The pulse and respiration may be natural, or more or less depressed; the face is usually pale; and the surface of the body cool. If the pulse is increased in

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pass through the brain in sleep, this fact is no proof that the diminished current is the cause of sleep. On the contrary, it is an effect and not a cause of the sleeping state. I do not deny that a modification of the current of blood, or its quantity in the brain, may sometimes have some influence in producing or preventing sleep; indeed, I believe that this is the case; but I do not think that natural sleep requires for its production either increased or diminished pressure in the brain. Sleep is nothing more than the repose of the cerebral functions. According to laws elsewhere fully developed in this work, the exercise of the various functions is followed after a time by a temporary diminution or cessation; and the rest thus obtained is essential to their healthy working. The activity, therefore, of the various nerve-centres, through the day, is followed by that suspension during the night which constitutes sleep; and this is altogether independent of any direct influence from the blood.

This is not a mere speculative question, but has important practical bearings. If sleep depends on diminished blood in the brain, the necessary inference is, that, without this diminution, there will be wakefulness or insomnia, which must, therefore, depend on an increased circulation through the brain, and must be treated on this principle. No doubt, insomnia is often the result of excessive excitement in the brain, whether vascular or nervous, and is then attended with an abnormal activity of the cerebral circulation. But it is equally true, as stated in the text, that it is often also dependent on a diminished excitement of the brain below the normal standard, and consequently associated with a depressed state of the intra-cranial circulation; resembling in this respect almost all the other morbid cerebral phenomena, which may depend on wholly opposite states of the brain in this respect.

Now the treatment of insomnia must be regulated by our views of the pathological condition attending it; and hence the importance of forming just conclusions. When a phenomenon of cerebral irritation, whether vascular or nervous, it must be treated accordingly; when of cerebral depression, the method of cure must be to a certain extent of a wholly opposite character; depressing agents being used in the former case, and excitant agents in the latter. (*Note to the sixth edition.*)

frequency, it is usually more feeble also. The duration of the attack is very uncertain; in some instances not exceeding a few minutes, in others extending to hours or days.

Upon recovering from the spell, the patient generally remembers his thoughts and feelings more or less accurately, and sometimes tells of wonderful visions that he has seen, of visits to the regions of the blessed, of ravishing harmony and splendour, of inexpressible enjoyment of the senses or affections. After the attack is over, he may return entirely to his ordinary health, and ordinary pursuits, or he may exhibit some permanent change of character, as the result either of the disease, or of the causes which produced it.

The disease is usually brought on by causes which occasion a strain upon the mental functions; a profound exercise of thought, for example, or an overwhelming excitement of the emotions or affections. It is most frequent in persons of a nervous temperament, and women are peculiarly subject to it.

The treatment is simple. During the continuance of the spell, little more is required than to take care that the patient is supplied with nourishment. Should the symptoms of prostration appear, they should be counteracted by external and internal stimulation. Should vascular irritation, on the contrary, threaten injury to the brain, it might become necessary to resort to the measures already recommended for that condition. In obstinate cases, the most effectual remedy would probably be to shave and blister the head. After the attack, attention should be paid to the functions; and especial care should be taken to avoid all causes of excitement.

2. Somnambulism.—This is a state of the system in which, with an apparently rational concatenation of thought, and the power of consistent action, the patient has completely lost the consciousness of his actual condition, and, in a greater or less degree, the susceptibility to ordinary exterior influences. As it occurs most frequently at night, during sleep, and the patient is apt to rise from his bed and walk about the house, or abroad, persons affected with it are commonly called *sleep-walkers.*

Symptoms.—The most striking phenomenon in the affection is the obvious unconsciousness of the patient of his real position. Like a dreamer, he fancies himself under circumstances which do not really exist, but, unlike the mere dreamer, he has the power of acting in accordance with those circumstances. He rises from his bed, in pursuance of some course of action in which he supposes himself engaged, or to accomplish some purpose which his fancy has suggested; and all his movements are well concerted to those ends. He appears to be utterly insensible to danger, and frequently puts himself in situations, as upon the roofs of houses, or on the brink of precipitous heights, in which, if awake, he would incur great hazard from the loss of all self-command. It is said that somnambulists, suddenly awakened in such situations, have fallen and perished. There appears to be a somewhat different condition of the senses in different cases. The eyes are in some instances closed, in others widely open. If, in the latter case, a bright light be held before them, it occasionally happens that no impression seems to be made; and other persons in the immediate vicinity are not apparently recognised. Sudden and loud noises may be made near the ear without being heard, or at least noticed. In some cases, one kind of food has been substituted for another, without any apparent perception of the difference; and snuff has been replaced by sawdust without a discovery of the imposition. Yet the somnambulist will perform offices which require the greatest delicacy of vision; will frequently answer questions that may be put to him; and often proves himself possessed of an acute sense of touch. It is obvious, therefore, that it is not the senses, but the perceptive faculty that is defective. The patient seems to be able to appreciate impressions only from sources which have some relation to the object of his pursuit at the time; or at least which fall in with the existing current of his thoughts and feelings. In reference to such points his senses are often more acute than in health. Thus, a somnambulist will perform acts requiring the use of sight, in the midst of a darkness in which he becomes entirely lost if awakened.

Occasionally the affection is associated with catalepsy. When aroused, the patient generally forgets the subject of his recent thoughts or actions; though he sometimes remembers them obscurely like a dream. It is asserted that, in some instances, the train of thought which had occupied the period of somnambulism, and which had been interrupted during the waking state, has returned upon the return of the paroxysm, and that this has happened in several successive alternations of the dreaming and waking state; memory being active in each condition in relation to its own incidents, while those of the other state are forgotten. If left to himself, the sleep-walker generally returns to his bed, sleeps naturally, and awakes at the usual time, quite unconscious of the incidents that have taken place, though sometimes fatigued by his exertions. He can often be awakened by disturbing him considerably in any manner; but among the most effectual methods is to throw cold water upon the surface.

Causes.—The causes of somnambulism are not always obvious. Sometimes it appears to be connected with derangement of the alimentary canal, or of the uterus. Intemperance is said to have occasioned it. In very mild forms, it is not uncommon in children, but generally ceases before adult age. The severer forms of it are said to occur most frequently in men under the middle age. The affection is asserted to be hereditary.

Artificial Somnambulism.—Animal Magnetism.—Mesmerism.—This affection bears a close analogy to the preceding, and, though it has been observed in a much greater variety of phases, is probably identical with it. The methods usually employed to bring individuals into this state are too well known to require description. I believe that it is of very little consequence what manipulations are used, provided the mind of the patient be impressed in that peculiar manner which appears requisite to the production of the results. A steady look of the operator, with an expression of earnest conviction upon his face, as if he had that full power over the nervous system of the one acted on which he claims to have, will very often be sufficient. The subject of the operation soon begins to be sensible of a not unpleasant heaviness; the eyelids usually close; and, in a period of time varying from less than a minute to twenty minutes or more, a state of apparent sleep results. But examination shows that the condition is very different from that of ordinary sleep. Thus, a cataleptic state of one or more of the limbs will sometimes be discovered on attempting to move them; and curious phenomena in relation to the power of muscular motion, or the loss of it, may be observed. Sensation is strangely modified. The patient is often quite insensible to painful impressions; so that a tooth may be extracted, or surgical operation performed without perceptible uneasiness. This has been too frequently tested to admit of reasonable doubt. But, while general sensibility is thus blunted, the special senses are often more acute than in health. The slightest sound, such as generally escapes notice altogether, is heard; touch is occasionally exquisitely sensitive; and there is reason to believe that vision is also remarkably acute. As in spontaneous somnambulism, it appears that all objects do not make an equally strong impression; but it is impossible to determine what principle it is that regulates this diversity of the sensorial function. The patient loses all consciousness of his real situation; but evinces, in various ways, considerable, and sometimes extraordinary mental activity. Present events apparently excite trains of thought which have no relation to the actual condition of the patient, but seem to be merely successive actions of the cerebral machinery, mental vibrations as it were, necessarily following the impressions from without. Thus, an individual acquainted with craniology, upon feeling the touch of a finger upon the part of the cranium corresponding with one of the supposed organs, will often set off into a most ludicrous series of actions illustrative of the operations of that organ. A slight sound, which no one else notices, suggests a course of thought in accordance with the cause of that sound, which strikes spectators sometimes as little short of miraculous. This property of somnambulism, connected with a wonderful sharpening of the memory, so that things long forgotten, and even circumstances that at the time of their occurrence seemed to make no impression, are recalled vividly, accounts satisfactorily for those phenomena, which, superficially viewed, have led to the most extravagant notions as to the mysterious powers imparted by this strange condition of the nervous system. The patient may often be induced to rise and walk about the apartment, and sometimes does so spontaneously, in order to act out the course of thought with which the mind may be occupied. The actions, corporeal and mental, appear to be under the guidance of principles entirely differing from those which characterize the individual in health; as if another spirit, with different views and feelings, had taken up a temporary residence in the body. Thus, I have seen a little girl, on all occasions diffident and even bashful in health, become in this morbid state pert and forward, joking with her elders and superiors, as if quite on a footing with them; and this change of character uniformly took place whenever the affection was produced. Along with the nervous phenomena above mentioned, there is a change in some of the organic functions, which, if there were any doubt upon the reality of the state, would of itself be sufficient evidence. The pulse is accelerated, and there is an increased production of moisture, which is especially observable in the hands.

Very different opinions exist as to the nature and causes of this affection. Many suppose it to be a peculiar condition of the nervous system, produced by the influence of another nervous system, in a manner analogous to the electrical changes which take place, when an excited electric is placed in the near vicinity of other bodies. Now this is not altogether impossible. But I hold it to be unphilosophical to adduce a new principle in the explanation of phenomena, which admit of explanation upon principles already established. I see nothing mysterious in this magnetic or mesmeric state, as it has been called; at least nothing more so than in hysteria, catalepsy, epilepsy, &c., in all of which there is much that we cannot understand. It is merely one of the different phases of nervous disease, and is induced by the mental condition of the individual affected; as an attack of hysteria is often induced by a fit of vexation.

The subjects of the disease are usually persons of nervous temperament, and generally in a position of inferiority, either physically, mentally, or by position to the operator; who, therefore, has a greater influence over their imaginations. The mysterious manipulations, the peculiarity of the occasion, the steadfast gaze of the operator, appearing as if he had no doubt of his own powers, excite in the susceptible mind of the subject a feeling of the strange, the mysterious, perhaps even of the awful, which appears to unhinge some connection in the brain necessary to keep the nervous machinery in its due order, and cause it to work for a while in a wholly new direction. Young women and children are most easily affected; and at each successive trial the effect is, in general, more readily produced; so that at last, in certain very susceptible individuals, a look is sufficient to throw them into the mesmeric state; and, indeed, the patient may fall into the state voluntarily, or spontaneously without any exercise of will. I have met with one instance in which a boy, who had been frequently acted on, was attacked with an affection in all essential respects similar, without apparent cause, and did not recover until, after two or three days of fruitless attempts by other means, a blister was at length applied over the whole scalp.

Artificial somnambulism may sometimes be usefully employed as a remedial agent. Nervous headaches, neuralgic pains, morbid vigilance, great restlessness, and various hysterical disorder may sometimes be removed, at least for a time, by bringing about this condition of system. The surgeon and dentist may also sometimes avail themselves of the insensibility to pain which it occasions, to perform their operations with less suffering to the patient. But, when it is understood that the person acted on is thrown into a condition in which, while passions may be developed, control over the conduct, and the influence of habitual principles cease, the practice must strike the reflecting mind as extremely hazardous, and fraught with the possibility of so much unmitigated evil, that it can scarcely be justified as a remedy, and is altogether unjustifiable on any other score. Besides, the nervous system is rendered morbidly susceptible, and a tendency to diseases of this system consequently fostered, by the frequent repetition of the process.

The morbid state, if left to itself, gradually subsides; but the restoration of the patient may be effected more speedily by artificial means. Among the most efficient apparently is a rapid motion of the hand near the patient, so as to bring a current of cool air in contact with the face. Probably a cup of cold water thrown upon the face would have a similar effect. In obstinate cases, it might be advisable to induce sound sleep by means of an opiate. This would imitate natural somnambulism, in which the individual, upon returning to his bed, falls asleep again, and awakes as usual in the morning. I have already mentioned one case in which a blister to the head appeared to me to be requisite. In relation to the cure of natural somnambulism, something may probably be done by attending to the general health, correcting any deranged function, especially of the digestive organs, or the uterus, obviating plethora if it exist, and giving an equable action to the nervous system by the metallic tonics, as the preparations of copper, zinc, or iron. The nervous stimulants, or antispasmodics, may sometimes be used advantageously. A combination of mugwort (*Artemisia vulgaris*) and assafetida has been recommended as especially efficacious. (*Ed. Month. Journ. of Med. Sci.*, Nov. 1851, p. 480.) Should the affection return nightly, and no sign of congestion of the brain exist, opium in full doses, or some other narcotic of similar powers, might be tried, in the hope of breaking the morbid habit. It is recommended to avoid suppers, and not to sleep upon the back.

3. *Motor Disorder.*

The motor faculty may be deranged in two modes, independently of a morbid increase under the influence of the will, in which case it is the latter faculty that is affected, and the patient may be considered as insane. The two modes of derangement alluded to are involuntary contraction or spasm, and loss of the power of motion or palsy. To the latter subject a special article will be devoted. Of spasm there are several varieties. One distinction is into *clonic* and *tonic spasm*, the former consisting in rapidly alternating contraction and relaxation, as in subsultus tendinum and convulsions, the latter of contractions having a certain duration, and attended with rigidity or hardness of the muscle, as in common cramps and in tetanus. The latter is usually painful, the former either not painful or but slightly so. The tonic spasm is sometimes also entitled *spastic contraction*. Another distinction is into, *first*, those contractions which bear no resemblance to ordinary voluntary motion, and would appear to be wholly independent of the cerebral machinery by which the will acts, as when irritation, for example, is excited in the course of the motor cords or filaments, and, *secondly*, those in which the will seems to have been replaced by a new and morbid influence, acting through the same channels, or by the same instrumentality precisely, as happens in the movements of chorea and catalepsy. Of several special diseases in which these different kinds of spasm are exhibited, I have had occasion to treat already, or shall treat hereafter under separate heads. Those only which require notice here are non-epileptic *convulsions* and *catalepsy*.

Convulsions.—*Eclampsia.*—These are clonic spasms of the muscles, producing visible motions of the limbs or other parts of the body, and generally attended with unconsciousness. When the contraction is slight, feeble, and brief, so as to occasion a mere catching of the tendons, with very little observable movement of the parts into which the tendons are inserted, the affection is denominated *subsultus tendinum*. It may or may not be accompanied with unconsciousness. It is an inferior degree of the same condition that exists in convulsions, often takes place under the same circumstances, and from the same causes, and is not unfrequently a precursor of them. It is exceedingly common in diseases of debility; and, except as an attendant on other complaints, scarcely requires notice. It is not, therefore, treated of here as a distinct affection. Should it become, in any case, the prominent object of attention, it must be treated upon the general principles laid down for the management of functional cerebral disease.

It is not of convulsions, in all their relations, that I propose to treat in this place. As a symptom of cerebral inflammation, and febrile diseases of all kinds, they have been sufficiently considered already. As occurring in epilepsy and hysteria, they will be the subject of consideration in separate articles. Puerperal convulsions belong especially to the department of obstetrical medicine. But isolated attacks of convulsions are frequently met with, which do not constitute an essential part of any other recognized disease, and which, though they may in some instances arise from sources of irritation existing in various parts of the body, are yet the prominent object of attention, and that which especially demands practical interference. It is to these that the following remarks apply.

Though occurring at all ages, they are incomparably more frequent in children before the conclusion of the second dentition than at any subsequent age, and are most frequent in infancy. Hence they are often considered separately, as belonging especially to this period of life, under the title of *infantile convulsions*. But there is nothing absolutely peculiar in the convulsions of infants; and the following remarks upon their pathology and treatment, except when necessarily exclusive from reference to the peculiar circumstances of infancy, may be considered as of general application.

Symptoms, Results, &c.—The attack of convulsions may either be preceded by other signs of nervous disorder, or may come on abruptly, without warning. The voluntary muscles of all parts of the body may be affected, or the spasms may be confined to one-half of the body, to a single limb, or to the features. There may be only a single attack, or several in more or less rapid succession. During the paroxysm, the face is sometimes pale, sometimes purplish or livid, the lips are bluish, the features often apparently swollen, the jugulars distended, the general surface more or less heated, and the pulse very frequent and often irregular. The abdomen is frequently swollen and tympanitic. Involuntary evacuations now and then take place. The duration of the convulsions is exceedingly variable. It may be only a few moments, or it may extend to hours or days; but, in the latter case, there is always some remission or intermission of the convulsive movements, though the comatose symptoms continue. Perhaps the average duration of each paroxysm may be stated at from five to fifteen or twenty minutes. In the prolonged cases, there is apt to be more or less rigidity or tonic spasm of the muscles. Upon the subsidence of the paroxysm, the patient is generally disposed to sleep, and not unfrequently remains somewhat comatose for a longer or shorter period. In some infantile cases, however, the child is bright and lively immediately after the cessation of the spasms; in others, the convulsions go off with vomiting. Occasionally, when the paroxysm is over, it is found that some serious cerebral or spinal lesion has taken place, as indicated by partial paralysis, strabismus, and various mental disorder; and sometimes the paroxysm is only the commencement of a series of subsequent attacks, occurring at irregular intervals, and constituting epilepsy. In these cases, the disease passes out of the category at present under consideration.

Convulsions sometimes end fatally, though not often unless connected with other disease. Simple uncomplicated functional convulsions are seldom very dangerous. In fact, the affection is itself probably in many instances a safeguard, by directing irritation from the nervous centres to the circumference. Nevertheless, convulsions may prove immediately the cause of death, by interrupting the due innervation of the lungs or heart; and they always demand a vigilant attention, as the possible evidence of very serious disease.

After death from pure convulsions, there may be nothing discovered in the brain to account for the result. But, in the great majority of fatal cases, congestion, effusion, softening, tumours, or other signs of inflammation or organic affection of the brain or spinal marrow, prove that the convulsion was, in these cases, merely a symptom of some pre-existing or coincident lesion; and very generally evidences of the existence of such lesion are presented during life, quite independently of the convulsive movements.

Causes.—The peculiar state of the nervous system in infancy and early childhood may be considered as a predisposing cause. Very impressible from the necessities of the organization at this age, it must of course feel more sensibly than at other periods of life the influences of disturbing causes. But there is also a great difference in children in this respect. In some the nervous system is peculiarly liable to this mode of derangement, either from inheritance, from powerful impressions, as some suppose, upon the nervous system of the mother during pregnancy, or from some inappreciable cause, which often determines, in all the children of certain parents, a predisposition of this kind. Nothing is more common than to see all or most of the children of one family peculiarly subject to convulsions, though the parents may have exhibited no such tendency in their own persons. Children thus predisposed show themselves more impressible than others by ordinary causes, start frequently, are unusually excitable, if not properly controlled are apt to be fretful or irascible, and occasionally exhibit great precocity. Among adults, females are, for the same reasons, more subject to convulsions than males.

The predisposition to the disease may also be induced by impure air, unwholesome diet, and whatever has a tendency to lower the general standard of health. For reasons explained elsewhere, the anemic condition strongly predisposes to convulsions.

The exciting or immediate causes are very numerous. Strong and sudden emotion, as fear, anger, surprise, &c., is a frequent cause. Insolation, excessive artificial heat, exposure to cold, over-exertion, and falls or other accidents, may induce convulsions. But they are much oftener the result of an irritation transmitted to the brain from some other part of the body. One of their most frequent sources is the irritation of teething. Perhaps even more so is that proceeding from indigestible or acrid substances in the alimentary canal. Articles of food not readily dissolved by the infantile stomach are often the cause of convulsions. So also are acid in the stomach and bowels, intestinal worms, and the acrid secretions consequent upon disordered hepatic function. Whatever occasions spasms in the intestines may induce convulsions; for there is nothing which more powerfully discomposes the infantile nervous system than violent pain. A cause, perhaps not sufficiently appreciated, is the milk of the mother or nurse. This occasionally produces the effect even when the nurse is apparently healthy. It is said that agitating or exciting emotions will sometimes so affect the milk as to induce convulsions in the suckling. The use of certain articles of food or of medicine may have the same effect. I have known convulsions in the infant to be the apparent result of antimonial medicines taken by the mother. Irritating purgatives or other medicines have sometimes the same effect directly on the child. The practitioner cannot be too strongly impressed with the importance of looking to the gums, and to the alimentary canal of children, as the seat of the cause of convulsions. The retreat of an habitual irritation from the surface of the body is another occasional cause. Hence, convulsions sometimes follow the disappearance of a cutaneous eruption. The irritation of hooping-cough sometimes provokes them.

Too great vascular fulness or excitement may induce the disease in those predisposed to it; and if, at the same time, there should exist peculiar nervous disturbance, convulsions will be very apt to result. Hence their great frequency in febrile diseases. Some children never have an attack of fever without convulsions. They are peculiarly frequent in the exanthemata.

Diagnosis.—The most interesting point, in the diagnosis of convulsions, is to determine whether they proceed from vascular irritation of the brain, or whether from mere nervous irritation or depression. In the former case, depleting remedies are important, in the latter, anodynes and nervous stimulants; and what may prove very useful in the one may be very injurious in the other. There are many in which the two conditions are mingled; and in which it is not possible to determine what share each of them may have in producing the symptoms. But this does not diminish the importance of making a correct diagnosis when it is possible. It is by the symptoms connected with the organic functions, and by a consideration of the cause in any particular case, rather than by the purely nervous phenomena, that the judgment is to be decided. In the cases of vascular irritation or congestion, the face is usually flushed, the pulse strong and tense, the surface warmer than in health, and the tongue often somewhat furred. The attack is frequently preceded by febrile symptoms; and, upon the subsidence of the convulsion, the elevation of pulse, heat of skin, and tendency to coma which remain, evince the existence of an active focus of excitement in the brain. In the purely nervous cases, without vascular irritation, the face is generally pale, or, if coloured, is so in consequence not of any active determination to the head, but of the interference of the convulsions with respiration, and is rather of a livid hue than red. The pulse may be very frequent, but it is not stronger, and is generally feebler than in health, and subsides upon the subsidence of the paroxysms. Upon the cessation of the convulsions, the child, instead of being comatose, is at most simply disposed to sleep, and not unfrequently appears as though nothing had happened, resuming his infantile occupation or amusements. Attention was strongly called to this fact, as affording an important diagnostic sign, by the late Dr. Joseph Parrish, who published an excellent paper on infantile convulsions from intestinal spasm, in the *N. American Medical and Surgical Journal* for January, 1827. The cause of the convulsion, and its frequent occurrence without preliminary cerebral disturbance, afford other valuable signs. Thus, when the source of the attack is some non-inflammatory irritation, as spasm in the stomach or bowels, for example, it would be inferred that the cerebral disease was probably also merely nervous, especially if unattended with the ordinary marks of active congestion of the brain. I have repeatedly seen children in a state of apparently good health, except, perhaps, that some evidence of colicky disease had been presented, suddenly scream, throw themselves back with stiffened abdomen as if from severe pain in the bowels, and go off into a convulsive paroxysm; and, upon coming out of such paroxysms, I have seen them look smilingly about, and begin to play as if nothing had happened. In such cases, there can be no doubt that the cerebral affection is purely nervous. An anemic condition of system would afford another indication, though not to be certainly relied on. Convulsions, arising from a positively depressing influence, are generally recognizable by their causes. When they follow the excessive loss of blood, or the operation of a directly sedative poison, as digitalis, tobacco, hydrocyanic acid, or sulphuretted hydrogen, they may be confidently referred to a depressed state of the cerebral functions. When dependent upon passive congestion, they may be known by their origin in morbid states of respiration, or in some other cause impeding the return of blood from the head.

Treatment.—This divides itself into such as may be proper in the convulsion, and such as may be required after it has subsided. During the paroxysm, whatever may be the precise pathological condition of the brain, the patient should be placed where he may breathe a fresh and pure air, of a moderate temperature, and especially not too much heated; and every part of the dress which may act as a ligature, should be loosened. Hot water may be immediately directed for the feet, sinapisms may be got ready for the extremities, and, if the head is at all heated or flushed, cold water may be applied in the manner before repeatedly directed to the scalp. In the mean time, investigation may be made into the cause and precise nature of the affection. Should the pulse be full and strong, the face turgid with red blood, and the previous symptoms such as point to the existence of active congestion, blood may be taken from the arm; and, should the same symptoms in some degree persist, leeches may be applied to the temples; but in the great majority of cases, there is no immediate urgency for these measures, and they may in general be omitted, or at least postponed until other means have failed. Hot pediluvia; sinapisms to the legs and arms, and over the epigastrium, care being taken not to allow them to be too strong with mustard, nor to remain too long in contact with the skin; cold water to the head; and a purgative enema, are usually sufficient in moderate cases of vascular irritation. Should the convulsion not yield to these measures, the patient may be placed in a warm bath, while cool applications are made to the head; and, if this should fail, and blood either not have been taken, or not sufficiently, the patient may be bled, or leeched, or both, as circumstances may seem to indicate. After failure with all these measures, a gentle emetic of ipecacuanha, if the patient can swallow, will sometimes put an immediate end to the paroxysms; and, in cases of much cerebral fulness, this remedy always comes in better after depletion than at the commencement.

Should the evidences of cerebral congestion not be decided, or the case appear to be one of mere nervous irritation, the use of antispasmodics, in connection with the other remedies mentioned, will be found advantageous. The feet may be enveloped in poultices of bread and milk or flaxseed meal, mixed with well-bruised garlic or onions; brandy heated with garlic, or a mixture of oil of amber, olive oil, brandy, and laudanum, may be applied warm along the spine, and over the abdomen; and assafetida, musk, oil of turpentine, or oil of amber, may be injected into the rectum. In these cases the inhalation of ether may be tried, and will probably often produce relief. One of the salts of morphia, given in the form of enema or suppository, or by subcutaneous injection, will often act happily in the absence of all cerebral congestion.

Sometimes it will be proper to attempt the removal of the cause, even during the existence of the convulsions, though in general this is best effected in the intervals. Thus, if there is reason to believe that indigestible food or other irritating matter may exist in the stomach, it should be evacuated by means of ipecacuanha, if the patient can swallow it, aided, if necessary, by a feather introduced into the fauces. The happiest effects occasionally result from this expedient in some obstinate cases. When convulsions can be traced to intestinal irritation, some of the measures to be pointed out directly may be employed with great benefit, even in the paroxysm. If the gums are swollen and apparently painful, they should be freely lanced.

But it very frequently happens that the physician does not see the patient till the convulsion is passed; and, when he arrives in time, he generally finds the simplest measures sufficient for its removal. It is in the intervals, for the most part, that he is called on to act, and can act most efficiently.

Here again the question as to the state of the brain comes up for decision. If vascular irritation exists, it is of great moment that it should be overcome; as an attack of meningitis, or an amount of cerebral lesion which might otherwise end in permanent epilepsy, may thus be prevented. If, therefore, there are fulness and strength of pulse, with stupor or headache, blood should be taken generally, or locally, or both; and in infantile cases a full cathartic dose of calomel should be administered, to be followed in due time, if it do not operate thoroughly, by a dose of castor oil. In doubtful cases, the practitioner may be content with the cathartic, which should seldom be omitted. The head should be kept cool, any existing febrile excitement met by means of the antimonials or neutral mixture, and nervous disturbance controlled by gentle antispasmodics, such as sweet spirit of nitre, Hoffman's anodyne, or camphor water. At the same time, gentle revulsion should be maintained towards the extremities; the bowels should be kept in a soluble state by saline laxatives, and the diet should be restricted to farinaceous substances, or, in infants, to these with the milk of the nurse in moderation. Should there be a disposition to the return of the convulsions, more decided revulsion should be effected by means of blisters between the shoulders or to the extremities; and, in obstinate cases, after sufficient depletion, it may be advisable to blister the whole scalp.

In cases of pure irritation, besides removing the cause, it is proper to diminish the nervous susceptibility, and to control the cerebral irritation by diffusing the excitement over the whole nervous system. To meet the first indication, narcotics may often be employed; and none is more efficacious than opium, which, to lessen its stimulant influence, may be combined in some instances with ipecacuanha. Hyoscyamus, lactucarium, or conium may be substituted, if on any account thought preferable. But before resorting to these remedies, the practitioner must be very sure of his grounds. He must be quite convinced that it is nervous irritation, and not active congestion of the brain that he has to encounter. The second indication above alluded to is to be fulfilled by antispasmodics, administered by the mouth, the rectum, or the skin, and by the use of tonics, of which the metallic are deemed most efficient. Of these the oxide of zinc has perhaps enjoyed most reputation, though the chalybeates should be preferred in anemic cases. Should the digestion be impaired, and the system at large feeble, the simple bitters or quinia might be preferable to the metallic tonics. These remedies may often be combined in the same prescription. Thus opium or hyoscyamus, assafetida, and either oxide of zinc, carbonate of iron, sulphate of quinia, or extract of gentian or quassia, may very properly go together. The cold or shower bath, cautiously used, may also serve to strengthen the nervous system. Fresh air and a nutritious diet of easy digestion are important.

In frequently recurring convulsions, resisting other measures, and threatening life, the practitioner would be justifiable in resorting to the inhalation of chloroform, which will often quickly quiet the spasms, and, if reapplied with each return, may obviate danger until the tendency is past. It has the advantage, moreover, over other narcotics, of not congesting the cerebral centres, though the danger of fatal prostration from its use must not be forgotten.

Even when asphyxia or apparent death may have resulted from the convulsions, hope should not be abandoned; but efforts should be made, by artificial respiration, to restore the function of the lungs, and consequently that of the heart. A case of recovery in an infant, by means of this measure, is recorded by Dr. A. W. Ely, in the *New Orleans Medical and Surgical Journal* (ix. 209).

But an account of the treatment would be imperfect, without a more particular reference to the mode of removing some of the more prominent causes.

When the gums are in fault, they should be freely lanced; and, if the tendency to convulsions continue, a pair of blisters should be applied behind the ears. If the affection is connected with acid in the stomach and bowels, recourse should be had to the antacids, of which magnesia may be used when a laxative effect is desired; carbonate of lime, if diarrhœa exists; aromatic spirit of ammonia, when a stimulant effect is indicated; and one of the alkaline carbonates or bicarbonates, when there is no special indication, and the extrication of carbonic acid in the bowels is not feared. The existence of worms would lead to the employment of calomel as a purge, and of oil of wormseed, or oil of turpentine, as an anthelmintic.

Any derangement in the hepatic secretion should be carefully observed, and treated with minute doses of calomel, blue pill, or mercury with chalk. When the disease depends on intestinal spasm, great advantage will often accrue from the use of laudanum with assafetida or spirit of ammonia by the mouth, the injection of musk into the rectum, the application of a mustard cataplasm or blister over the abdomen, and if, as often happens, the bowels are distended with flatus, from the introduction of a catheter into the colon, and drawing off the air by means of a syringe. This last measure is sometimes of great importance. It was recommended by Dr. Parrish in the paper referred to, and I saw it employed with the happiest effects more than forty years since. Should the disappearance of a cutaneous eruption have preceded the convulsion, efforts should be made to restore it by friction with croton oil, or other active irritant. In urgent cases, a blister might be produced by means of the strong solution of ammonia on the surface previously affected. Finally, great attention must be paid to the diet of the patient, in order that nothing irritating may enter the stomach; and, when there is any reason to suspect the milk of the mother or nurse, it should be changed for that of another and perfectly healthy woman.

2. Catalepsy.—This term, derived from the Greek κατάληψις, a seizure, is used to designate an affection, characterized by a loss more or less complete of consciousness, with a peculiar rigidity of the muscles, causing the body, and each portion of it, to retain the position in which they may have existed at the moment of attack, or in which they may afterwards be placed. The disease is seldom idiopathic or solitary; but is generally combined with some other affection, especially hysteria, somnambulism, or insanity. It may attack both sides of the body, one side only, or a single limb. Sometimes the attack is preceded by signs of nervous disorder, sometimes comes on without premonition. In a case described by Dr. Puel, the disease came on periodically; each paroxysm being preceded by severe pain and great tenderness in the epigastrium. (*Arch. Gén.*, Août, 1857, p. 208.)

When the whole body is attacked, the patient becomes stiff like a statue, and remains standing, sitting, or lying, according to the posture at the time of seizure. Upon any attempt to move the limbs by another, though there is some degree of stiffness, they generally yield to the impulse, and afterward retain the position in which they may be placed, however ludicrous or seemingly painful. The features are usually composed; though it is said that the muscles of the face obey the general law, and that the same expression of countenance is retained as may have been exhibited at the moment of attack. The pulse is variously affected, being in some instances healthy, in others accelerated, and in others again diminished both in frequency and force. During the continuance of the attack, the evacuations are either suppressed or involuntary.

The duration is quite uncertain. It may be only a few minutes, or it may extend to hours and days. In some cases, the attacks are repeated with greater or less frequency, and in this way the complaint may continue for months or years. Upon the solution of the paroxysm, the patient often complains of headache, and a feeling of muscular soreness or fatigue; but is in general wholly unconscious of what has passed, and sometimes, it is said, resumes a conversation or action, in which he may have been engaged when attacked, at the point at which it was interrupted.

There is usually in the intervals some evidence of nervous disorder, very often connected with derangement of the alimentary canal, or, in the female, of the uterus.

The disease exhibits considerable diversity of symptoms. The rigidity varies, being occasionally so great as to resist strong efforts to overcome it, and in other cases so slight that the limb will not retain a new position, but falls slowly if elevated. Sometimes a degree of consciousness remains; and certain muscles may be moved under the influence of the will, while others are cataleptic. Cases, too, have occurred, in which the patients upon recovery have declared that they were perfectly aware of their condition, and of all that was going on around them, but utterly unable to speak, or to move the voluntary muscles, even those of the eye. In some very rare instances, circulation and respiration have been so far reduced as to be scarcely if at all observable; and the individuals have been supposed to be dead. But the expression of the face, the retention by the limbs of any new position in which they may be put, or an inflexibility greater than that of death, and the preservation of a certain degree of animal temperature, will generally serve to distinguish these cases if closely observed. It is probable also that some action of the heart would be discoverable by the stethoscope. A piece of cold clear glass, held before the lips, would detect any remains of respiration by the condensation of moisture. In itself the affection is generally innocent; but it is apt to be associated with cerebral disease, which may end in cerebritis, apoplexy, or insanity, and with serious organic disease of the viscera.

Causes.—An excitable condition of the nervous system, analogous to that which exists in hysteria, constitutes a predisposition to this affection. Women and children are peculiarly liable to it. Any strong emotion, or unusual or protracted intellectual exertion, may serve as an exciting cause. Strong sexual desires, or excessive indulgence, are said to have brought on attacks. Paroxysms of the disease have also been ascribed to worms, to the retrocession of cutaneous eruptions, to menorrhagia, and to the cessation of habitual discharges. Probably the most frequent exciting causes are stomachic, intestinal, and uterine irritations.

Treatment.—If the pulse appear to call for it, blood may be taken from the arm, and by leeches or cups, once or oftener, from the temples or back of the neck. Purging is also indicated, especially in cases of amenorrhœa, in which aloes should be employed in full doses. Cold should be applied to the head, if it be in any degree heated. The warm bath may be tried, though its utility is not universally admitted. All the organic functions should be maintained as nearly as possible in the healthy state. Any spinal irritation that may exist must be corrected in the usual manner. Should the paroxysms be periodical in their recurrence, quinia might be expected to prevent them. Anemic cases would require the chalybeates. Nitrate of silver has been employed successfully by Dr. Wm. R. King, of N. Carolina. (*Am. Journ. of Med. Sci.*, Jan. 1858, p. 144.) Debility must be counteracted by tonics, the shower-bath, or sea-bathing, exercise in the intervals of attack, and a nutritious, easily digested diet. Advantage may sometimes accrue from the nervous stimulants; and oil of turpentine with aromatic spirit of ammonia, given several times a day, in connection with the warm bath, was used successfully by Dr. Radcliffe in the case of a child who was very severely affected. (*Arch. Gén*, 5e sér., i. 329, from the *Lancet* for 1852.) Should respiration be suspended, it should be restored artificially. Advantage has accrued from gentle friction along the cataleptic limb, especially from above downward, along the course of the affected muscle. (Puel, *Arch. Gén.*, Août, 1857, p. 210.)

Article V.

INSANITY.

Syn.—*Madness.—Mental Derangement.—Lunacy.*

INSANITY is a general term, including all derangements of the intellectual and moral functions, not forming a part of some other recognized disease, nor an ordinary physiological result of the time of life. The delirium of fever, the hallucinations of hysteria, the temporary cerebral irregularities from excessive pain or functional disturbance in various parts of the body, the irrational confidence and hopes of phthisis, the equally irrational depression of dyspepsia, the stupor of apoplexy, and the imbecility of old age, can scarcely be considered as falling within the meaning of the term. Yet it must be acknowledged that the definition is imperfect, and perhaps necessarily so; as our ideas of insanity are somewhat indefinite, and, when precision is wanting in our conceptions, it cannot be given by words.

The disease is seated essentially in the brain. It is through that organ exclusively that we think, and experience emotion; and derangements in these two modes of mental exhibition, whatever may be their remote cause, are necessarily cerebral disorders. But insanity is by no means a simple mental condition. The brain, if not a complex organ, certainly has complex functions; and it may be deranged in the whole of these functions, or in one only, or in any number of them, and there is scarcely an end to the diversity of mental disorder which may thus arise. Some arrangement, however, is necessary for the purpose of description; and I know of none better than that which divides the disease, *primarily*, into general and partial insanity, and, *subordinately*, into mania and dementia, belonging to the first division, and moral insanity, monomania, and insane impulse, belonging to the second.

By *general insanity* is meant a derangement, in a greater or less degree, of all the cerebral functions connected essentially with mind; by *partial insanity*, a derangement of one or a portion only of these functions. *Mania* is that form of general insanity in which there is an exaltation of the cerebral actions; *dementia*, that in which the brain is enfeebled, and the mental operations all participate in its weakness. Partial insanity takes the name of *moral insanity*, when it affects only the emotional functions, as contradistinguished from the intellectual; of *monomania*, when, with a general soundness of thought, there is delusion upon some one point, or in some one direction; and of *insane impulse*, when, without reflection, and without any known perversion of the feelings or passions, the patient is irresistibly impelled to some insane act. Each of these modes of insanity requires a distinct description.

It is necessary to guard against the mistake of supposing that all cases of insanity can be referred clearly to one or the other of these varieties. Each one of them is occasionally well characterized; but cases are constantly occurring, either intermediate in their nature, or combining the peculiarities of two or more of the varieties, so that it would be impossible to refer them to any one division; and the same case occasionally exhibits, in its different stages, all the different phases of the disease.

As to the relative frequency of the several forms of insanity above referred to, it may be stated, in general terms, that the cases of general insanity, so far as can be inferred from the returns of hospitals, are more than one-half of the whole number. In relation to the subordinate varieties, mania and monomania are probably nearly equal. Esquirol, however, considers monomania as more frequent than mania; and the probability is, that of the insane who are not treated in the public institutions, much the larger proportion belong to the former class. The cases of mania greatly exceed in numbers those of dementia; and of monomania those of pure moral insanity, and of insane impulse.*

Symptoms, Course, &c.

1. **Mania.**—This sometimes makes its attack suddenly, with little or no premonition; but much more frequently its approaches are very gradual, and often for a long time unperceived. After the nature of the case has become quite evident, the friends of the patient frequently call to mind traits of character and conduct, which had, perhaps, somewhat surprised them, which they had ascribed to eccentricity or whim, or which had given them uneasiness as evincing a failure of principle or customary prudence, but which they had not thought of referring to their true source in commencing insanity. In this early stage, the patient sometimes evinces disorder only by a certain exaggeration in his feelings, views, expressions, and actions. He is apparently eager and enthusiastic, but generally unstable; flies from one object to another; and is found, perhaps, at last, to have been busied with trifles. He speaks much, but vaguely, of his engagements, projects, and expectations; all of which come to nothing when examined. Not unfrequently he imagines evil of certain individuals; attributes to them impertinent interference in his own concerns, or some departure from general rectitude; and sometimes gains a partial belief from the unwary of his insane fictions in relation to their character and actions. His most intimate friends and relatives are often the subjects of these suspicions and charges. His feelings are morbidly excitable. He is irritated by slight causes; often speaks in a quick and elevated tone; is restless and anxious; loses much sleep; and not unfrequently rises from his bed at night, and walks about the chamber. At length, upon the occurrence of some unusual excitement, some opposition to his views or wishes, perhaps even of some unguarded and scarcely intended charge of insanity extorted by his singularities, he breaks out into violent and wholly irrational expressions; and his friends, convinced of the nature of the case, only wonder that it had not long before occurred to them. Not unfrequently, however, the increasing

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* Of 4323 insane patients admitted into the Pennsylvania Hospital, since the separate existence of the insane department, 2028 are classed under mania, 1155 under melancholia, 595 under monomania, 532 under dementia, and 18 under delirium. As monomania is defined in this work, it includes the cases of melancholia, so that the whole number is 1750, or about one-seventh less than those of mania. (*Report of the Penn. Hosp. for the Insane for the year* 1864, p. 18.)

development of the disease forces itself upon the attention, without any special and temporary occasion of excitement.

Instead of this preliminary excitation, a wholly different character of feeling and deportment is sometimes exhibited. The patient is calm, but, if left to himself, is constantly imagining false facts, and forming false judgments of things and persons. The state of his mind is not at first obvious to others, because, when roused to exert himself, he can think correctly, and pursues his usual avocations, if with less energy, yet without any very visible want of judgment. In time, however, the affection increases, and his insanity becomes quite evident. Sometimes a period of great mental dejection or anxiety, perhaps consequent upon external circumstances, perhaps without obvious cause, precedes the period of false excitement or illusion.

Between the two extremes of mental condition above alluded to, as characterizing the forming period of insanity, there is every possible gradation; and the modes in which the intellectual and moral aberration shows itself are diversified beyond all power of description. One prominent phenomenon, exhibited probably in the great majority of cases, before the occurrence of open and acknowledged insanity, is want of sleep. This is important in a therapeutical point of view; as it cannot but exert an unfavourable influence over the progress of the disease, and affords an indication of treatment which, if attended to, may sometimes lead to effectual preventive measures. In women the preliminary symptoms are sometimes of an hysterical character. After an unusually violent paroxysm of crying, sobbing, laughing, and perhaps of temporary unconsciousness, the patient is found, upon the subsidence of the nervous phenomena, to have quite lost her reason.

The initial or incubative stage of insanity varies greatly in duration. It may not exceed a few days, or it may extend to months and years.

It has been stated that the disease sometimes comes on suddenly. In such cases, it is apt to have an *acute form*, and exhibits, in a greater or less degree, the phenomena of ordinary meningeal inflammation. Before the attack, the patient may complain of headache, vertigo, tinnitus aurium, &c., which disappear upon the occurrence of delirium. The pulse is increased in frequency and force; the face is flushed, the eyes are wild; the tongue is coated with a white fur; there are thirst, anorexia, constipation, scanty urine; the patient is restless, agitated, sleepless, often violent; he talks incessantly, raves, screams, laughs, flies from one thought to another, and is kept in bed only by force. The fever, however, is not usually so high as in common acute meningitis; there is less tendency to stupor; and the progress of the case is not so rapid. After a variable period of from one to three or four weeks, or longer, either the symptoms assume the character of cerebral oppression, and death ensues preceded by coma; or, what is much more common, a gradual amendment takes place, the febrile symptoms subside, the tongue cleans, the appetite returns, and the patient becomes convalescent, so far as the general health is concerned. It often happens that the delirium disappears with the other symptoms, and perfect recovery takes place. But often also the mind remains disordered, and a state of chronic insanity results.

The degree of this febrile and inflammatory disturbance is very different in different cases. It is almost always greatest in the abrupt attacks. In those which have approached gradually there is often little of it observable. There may be a slight increase of the circulation and of the general temperature, some fur upon the tongue, an offensive breath, and more or less loss of appetite; there may be some gastric or intestinal uneasiness; the skin may be dry; the menstrual flux in women, and any accidental discharge in men, may cease; and some emaciation may take place; but the patient is not ill enough to be confined to bed, and not unfrequently continues upon his feet as if in health.

insane fury. Broken thoughts chase one another with fierce haste through his brain; every wild and evil passion, malice, fury, hatred, revenge, despair, struggle as if for mastery in his agitated features; his hair stands on end; every trait of his meagre countenance is distorted; even his intimate friends would scarcely recognize an acquaintance in the demoniac before them. It is not to be understood that every case of mania offers paroxysms so violent as this, nor that all the particular features are united in every violent case. In some instances, the paroxysms are very feeble, consisting in nothing more than occasional aggravation of the ordinary symptoms under exciting influences. Nor is it to be understood that even the greatest violence is always so incoherent in its mode of expression. Occasionally, even maniacal patients confine themselves to one strain of feeling or thought. I have known a patient to rave, scream, and implore for an hour continuously, under the impression that he was surrounded by robbers who aimed at his life. After the subsidence of the paroxysms, the patient is weak, exhausted, pale, frequently gloomy and silent, or talks to himself, and apparently broods over his troubles.

A short reference to the state of the individual psychological functions will close this description. *Sensation* is not in general materially deranged. Sight and hearing are sometimes more acute or sensitive in the early stages than in health; patients are occasionally extraordinarily insusceptible to extreme cold, and to painful impressions, or at least unmindful of them; and in the advanced stages there is often some decay of the senses, especially of hearing. But, until the affection lapses into dementia, morbid sensation is not a striking phenomenon. The *perceptive faculty*, moreover, is for the most part not very prominently affected. The patient usually recognizes persons and objects, appreciates sounds, and receives tolerably correct impressions through the senses of smell and taste. But this is not always the case. The perceptions are sometimes quite illusory. Imaginary sights are seen, imaginary sounds are heard, the patient converses aloud with imaginary persons, and there is reason to believe that his perceptions of odour and taste are different from those of health. One kind of misapprehension is not uncommon. The patient, struck with some real or fancied resemblance between a stranger and one of his friends or relatives, a wife, a husband, a child, for example, mistakes the former for the latter, and lavishes upon the new personage the attentions which the reality of the supposed relation would suggest. Even brute animals, or things without life, may become the objects of such attentions. Thus, a bird, or a cat, may be gifted with the attributes of humanity; a pillow, or a stick of wood, may be fondled as a child; and we may sometimes see a patient holding up a bed, or lifting up a flower-pot, to save the bedstead or the flower-stand from fatigue. But it is probable that mistakes like these arise more from a perverted mental action subsequent to perception, than from disorder of the perception itself. The *reasoning faculty* is always deranged. But it is not abolished. The patient can often follow out trains of ratiocination with considerable correctness, and sometimes even with much ingenuity. But he is apt to change abruptly from one course of thought to another before the first is completed; each idea that presents itself, however irrelative, becomes the starting point of a new succession, which is, in its turn, soon interrupted; and his intellectual action is thus broken up into disjointed fragments, fitted to no useful purpose. Again, the maniac may argue for a time with a show of reason; but he is apt to base his logic upon some ludicrously absurd assumption, of which he cannot perceive the folly, and therefore reaches equally absurd conclusions. He often, besides, mistakes some slight semblance, some mere shadow of association, a similarity of sound in a word, for example, for a legitimate link in a chain of reasoning, and thus, even when starting from correct premises, is led into the most egregious errors. The *judgment* is, perhaps, more perverted than any other faculty. It is the quality of mind which is most rarely perfect in health, and which might, therefore, be expected to be most defective in mental unsoundness. The maniac cannot duly appreciate his elation to the world around him, cannot shape his course in accordance with he various interests, opinions, and feelings of others, and is, therefore, contantly encountering difficulties and vexations, which aggravate his disease, and generally render confinement essential. The *imagination* in mania is often greatly excited, fruitful in its suggestions, not unfrequently brilliant in its illusive picturing; but always deranged. The pictures which it forms, like the workings of the insane reason, are without due connection or relation of parts, mere jumbled assemblages of the grotesque, the ludicrous, the wild, the fearful; shifting, too, like dreamy phantasms, to which it is probable that they bear no slight resemblance. *Memory* is one of the faculties that suffers least in this variety of insanity. Maniacs can often vividly recall past events, whether relating to themselves or others; and they sometimes take a malicious pleasure in suggesting disagreeable recollections. Even incidents which attend heir illness they frequently remember with greater or less accuracy, and often, after recovery, have a vivid recollection of the kindness or harshness with which they have been treated, and feelings such as these recollections are calculated to excite. The *imitative quality* is also retained by them in a considerable degree; and, like children, or some of the lower animals, they may often be induced, by the example of others around them, to regulate their deportment, and restrain their insane propensities. We may often most usefully avail ourselves of this property of the maniacal character in our course of treatment. It is a fact of some interest, that, in the cerebral excitement of mania, faculties which before lay dormant, have been sometimes called into existence, as, for example, those of music and painting; and a certain degree of *wit* or *humour* is not uncommon, either retained amid the ruin of nobler powers, or generated by the new stimulus to the brain.

The *emotional functions* are not less disordered than the intellectual. In some cases, there is a morbid exaggeration of the natural qualities; in others, a complete change. In general, the maniac is more irascible than in health, surrenders himself more readily to every impulse, is often suspicious, revengeful, malicious; and the countenance is sometimes fearfully expressive of his uncontrolled passions. Among the most common results of the disease is an alteration of the natural affections. Connubial, parental, and filial love are not unfrequently exchanged for indifference, forgetfulness, even suspicion and hatred. The dislike of the insane for their former nearest and most intimate friends is almost proverbial; and the exhibition of such a dislike is sometimes among the first observable symptoms of the disease. Excesses of pride, ambition, and vanity are frequently witnessed. But the kindlier emotions are occasionally also morbidly developed or directed. The insane not unfrequently form irrational or whimsical attachments. Love, in its purest form, is sometimes exhibited, especially by women, who betray their insanity by openly lavishing marks of tenderness, which in their sane state they would have been most solicitous to conceal. Delicacy and the sense of shame appear often to be quite abolished. There is not unfrequently a strange propensity to go naked. Lascivious desires are expressed openly by language and gestures. Personal cleanliness is disgustingly neglected. Patients sometimes smear themselves with their own excrement. Notwithstanding the violence of maniacs, they are usually wanting in steady courage. It has been often observed that, if regarded fixedly and firmly by a sane individual, especially one having official power over them, they will drop their eye, and yield for a time, though the moment before fierce and threatening. But this is not universally true; and some caution is advisable not to trust too much to their presumed sub-

Dementia sometimes occurs as an original a
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recollect remote events, but those passing at the
and are forgotten quickly. Words also are for
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perhaps occurred in his youth. The power of
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any rational conclusion. The feelings, conscienc
decay. Former friends are seen without emotion;
joy seems to be alike impaired or lost; only som
as ambition or avarice, may yet exert an influe
the conduct. Patients in this state are not un
habitual employments, which require no mental
games, draw, paint, knit, and perform various
siderable efficiency and regularity. But, in the p
these feeble powers are lost. There is a total
thought. The man is reduced to the state of
The lower animal functions still remain. Some
cular activity, jump, run about, dance in circles,
uttering words or parts of words rapidly and wi
Others are quite silent, sit crouching in the same
only under the guidance of others, and to which t
pay no attention to things or events about them
heat and cold, eat only when food is placed before
to personal cleanliness or to decency in the of
rition, look at you with a meaningless stare, a va
At last, scarcely any consciousness is evinced; an
that of a mere vegetative existence, perhaps with
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however, of this affection, the brain appears cap
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some excitement of the passions, some little sho
then appear, like *ignes fatui* in the darkness. D
from the supervention of various acute or chro
diate connection with the brain; or it may appa
bral affection, life being terminated by an apople
gress of paralysis.

It is a singular fact, that individuals who have
state of vegetative existence, entirely silent, app
and caring for nothing, eating only what was
tentive to their person, have suddenly thrown of
their usual mental activity, with or without a co
Earle relates the case of a young man, brought for
his care, who had sunk into a state of lethargy an
mained without speech for several weeks, and w
for many months. All at once he roused himself
the doctor was first made sensible of the change
of a circle of the inmates of the house, convulsi
antics and witticisms. In such cases, the dement
only apparent, and the obstinate simulation of
termination. In the case, however, referred to, i
relapsed, and fell into the same state of dementi

The proportion of the phosphates excreted with the urine, in cases of dementia examined by Drs. A. J. Sutherland and Bence Jones, is much below that of the healthy standard, owing, as supposed, to a deficiency of cerebral action. (*Med.-Chirurg. Trans.*, xxxviii. 281.)*

3. Moral Insanity.—The existence of derangement of the emotional functions, distinct from the intellectual, has been long admitted. Pinel called attention, in 1831, to a form of this disease, which he named "mania without delirium," or "reasoning insanity." Numerous examples of the affection are given by Dr. Rush, under the name of moral derangement, in his treatise on "*Diseases of the Mind*," published in 1812. But the subject has been most elaborately considered by Dr. Prichard, who gave to this variety of mental disease the title of moral insanity, and defined it to be "a morbid perversion of the feelings, affections, and active powers, without any illusion or erroneous conviction impressed upon the understanding." There are numerous individuals mingling in society, and participating in the ordinary avocations of other men, whose sentiments and conduct are so peculiar as to attract general attention; but who can reason so well upon all subjects within their capacity, and whose intellect is often so clear, and, in many instances, even strong, that no one questions their sanity. They are simply said to be singular or eccentric. Now the fact is, that such individuals are not unfrequently as much under the control of their morbid feelings, act as irrationally in obedience to these feelings, and are morally as little responsible for their acts, as others who carry out in their conduct some false conclusion of the intellect. Such persons should certainly be considered as insane. It may not be easy to draw the line, in all of these cases, between sanity and insanity, to determine how far the deviation from the ordinary course may proceed without passing the limits of mere eccentricity; but the same difficulty is experienced in defining with precision the boundary between health and disease in general. The case may be considered as coming within the province of insanity, when the conduct of the individual materially interferes with the safety or comfort of other persons; and, in doubtful instances, the judgment may be very much aided by the consideration of the origin and causes of the peculiar state of mind. If there has been at any period a marked change in the feelings; if the individual affected was at one time like other men, and fell into the new condition after some great misfortune, or other circumstance calculated very much to disturb the mind; if the affection can be traced to an attack of illness, or has occurred in one previously affected with ordinary insanity, or descended from ancestors who had been insane, there would be little hazard of mistake in ascribing the peculiarities of the character to this disease. It must not be understood that the patient may not form erroneous judgments in moral insanity. Like all others under the influence of strong feelings of any kind, he is liable to be warped in the formation of his opinions; but these are not manifestly absurd, or of a character to exhibit any peculiar deficiency of reasoning power.

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* It has been already stated (*page* 798), upon the authority of Dr. Sutherland, that the proportion of the phosphates excreted in acute mania, in the stage of excitement, exceeds the healthy standard. This fact is rendered somewhat doubtful by the researches of Dr. A. Addison, of the Montrose Royal Asylum, which have led him to the following conclusions. 1. The quantity of chloride of sodium, urea, *phosphoric acid*, and sulphuric acid, excreted in a maniacal paroxysm, whether in acute mania, melancholia, or dementia, is less than in health. 2. The same ingredients are, in chronic melancholia, below the mean, and sometimes below the minimum in health. 3. In dementia, with or without paralysis, the chloride of sodium, urea, and sulphuric acid may be above or below the healthy medium; while the *phosphoric acid* is, in the majority of cases, between the mean and minimum, but sometimes above the mean. These results certainly do not correspond with those of Dr. Sutherland; but the difference may be explained upon the presumption, that the experiments of Dr. Sutherland referred to the proportion of phosphates in any given portion of urine, those of Dr. Addison to the quantity of phosphoric acid excreted in a certain time. (*B. & F. Medico-chir. Rev.*, April, 1865, p. 425.)—*Note to the sixth edition.*

The disorder may evince itself in the general condition of the feelings, or in reference more especially to a particular passion. Sometimes it appears to consist in a state of general excitement. The patient exhibits an excessive cheerfulness or hilarity without cause, cherishes confident hopes, forms magnificent projects, makes large purchases, enters into imprudent speculations, or lives in a constant state of spiritual exaltation. In other instances, there is an equally causeless depression; everything is viewed through a medium of gloom; the patient can see no pleasure in store for him; he is apt to be retiring, solitary, moody; and occasionally withdraws from all social intercourse, and shuts himself up in his apartments for months, or perhaps for years.

Another form of moral insanity is that of excessive irascibility. The least opposition is apt to throw the patient into ungovernable rage, driving him to the commission of acts, of which in his cooler moments he repents, and for which he may be ready to apologize; but which are repeated again under similar circumstances. A regard for public opinion, or the fear of personal consequences, will often be sufficient to control the expression of these feelings; but, when no such restraint exists, they are allowed full sway, and the patient seems to take an insane delight in their indulgence. To abuse or even strike a fond parent, or other near relative or friend, to curse and revile, to pour out torrents of reproaches and accusations without foundation, and, when there is powerlessness at the same time, to scream and roar, and use all kinds of frantic gestures in the violence of impotent rage, are among the acts of persons affected with this species of insanity. Yet, towards the world at large, their conduct may be irreproachable; and, though often willing to admit themselves in the wrong to the objects of their excitement, they find plausible excuses which deceive the multitude, and sometimes make themselves appear to be persecuted individuals.

The disease may take the form of suspicion or jealousy; or it may appear as a complete want of the moral sense, or conscience, so that the person affected shall be incapable of the feeling of wrong or criminality; but lie, defraud, and, if he dare, steal, without compunction, and even with a keen relish. Sometimes it is revenge, hate, or mere cruelty that constitutes the insanity, and persons of this kind take a fiendish delight in the infliction of pain. The passion of love, or the coarser sexual propensity, is liable to the same mad excesses, and sometimes leads to the most fearful acts. As observed by Dr. Prichard, there is apt, in this kind of insanity, to be a disregard for the feelings of others, an extraordinary degree of selfishness, and at the same time a want of decent reserve, in many instances, in regard to the concerns of the patient, his domestic difficulties or relations, arising perhaps from inability to appreciate the feelings of others, or to suppose that they are different from his own. An irresistible propensity to the abuse of alcoholic drinks, which is now and then met with in individuals paroxysmally, and quite independent of the mere habit of drinking, may be referred to this affection.

This form of partial insanity, if not subdued, is very apt in time to end in monomania. The excess of a particular passion leads at length into some fixed illusion connected with the existing propensity; and the patient, before considered merely eccentric, perhaps condemned for his excesses, perhaps punished as a criminal, is now acknowledged to be insane.

4. Monomania.—This expressive title was proposed by Esquirol, who, however, confined it to those cases in which the insanity was limited to a single object, or a small number of objects, "with excitement, and the predominance of a cheerful and expansive passion," while to that form of the disease in which the solitary or limited delusion was attended with "predominance of a melancholy and depressing passion," he gave the name of *lypemania*, synonymous with the *melancholia* of the ancients. But, though there are cases in which this difference in the state of the feelings is very obvious, yet others occur in which it would be very difficult to decide which of these dispositions predominates; one, perhaps, prevailing at one time, and the other at another, or no peculiar tendency to either being exhibited. There does not appear, therefore, to be any ground for such a division in the essential nature of the affection; and the term *monomania*, as here used, is applied to all cases of illusion upon one subject, or in one direction, without reference to the state of the feelings. The *moral insanity* of Dr. Prichard has been included by Esquirol under monomania; but surely there are cases in which the passions, the sentiments, the conscience are delirious without the reason; in which the moral as contradistinguished from the intellectual nature is the main seat of the affection. A proper view of this subject is important both in its therapeutical and medico-legal relations; for, if intellectual delusion is made a necessary ingredient of insanity, many a curable patient will be allowed to pass, through neglect, into confirmed insanity; and many an unfortunate person will be sentenced to the gallows or the prison, who would be more appropriately sheltered in a lunatic asylum.

The statement that the monomaniac is quite sane upon all other points than in relation to the subject of his illusion must be received with some allowance. There may be such cases; but they are comparatively rare. In most instances, something peculiar will be discovered in his general mode of thinking and acting, something in which he differs from other men, and from what he himself was before the commencement of his disease. He would be counted among eccentric individuals independently of his peculiar insane notion; and, in different monomaniacal cases, there is a gradation of insensible steps, from this mere eccentricity up to the limits where undoubted insanity begins.

In the greater number of monomaniacal patients, the intellectual illusion is connected with a morbid exaltation of some one of the passions, and is probably based upon it. The exaggerated passion places objects calculated to gratify it so frequently and so strongly before the imagination of the patient, that they appear at length to the mind's eye with all the distinctness and reality of an impression through the senses, a suggestion of the inner consciousness, or a conclusion of the judgment. He can no more refuse to believe them, than to believe in the existence of what he sees or feels, or in a self-evident truth. Hence it is that moral insanity so frequently ends in monomania.

It is a singular fact, that, though quite confident of the truth of his insane notion, the monomaniac not unfrequently either has some imperfect consciousness of his want of sanity, or, what is more probable, is able to appreciate the opinions which others would be apt to entertain of it, were the real state of his convictions made known. Hence, he will frequently conceal it carefully from the knowledge of others; and, when at length his delusion has become so intense as quite to have got the mastery over his judgment, it will be found that he has long secretly cherished this insane notion, while mingling unsuspected in the world.

The character of the insanity may depend on the previous dominant passion, and will not unfrequently also be influenced by the original cause of the affection. A morbid pride or ambition will make the monomaniac a governor, a president, a nobleman, a king, a god; and sometimes even personal identity is lost, and he becomes some particular great man who may happen to occupy largely the attention of the world. Thus, there were many Napoleons during the career of that great commander. It is highly probable that many of the pretenders to thrones, who have been punished as criminals, were really monomaniacs, who had full faith in the justice of their claims. The peculiar tendency of the mind to cheerfulness or despondency will affect the nature of the conviction. Thus, the ambitious, cheerful monomaniac will imagine himself a monarch on his throne; a melancholy one, on the contrary, though he may possess the same dignity, does so in a prison or in chains. From excess of avarice springs the belief, on the one hand, of immense wealth, on the other, of broken fortunes, and probable death in a poor-house. Vanity will plume herself on high fashion, or splendid dress, or will mourn over some beauty supposed to be extinguished, an eye, for example, that has lost its softness, or a form its grace. Love will be exquisitely happy in the exercise of its own sweet attachments, though the object may be absent, or dead, a superior being, a brute animal, or a piece of inanimate matter; or it will pine over imaginary desertion, over vows that have been broken, or affections in the grave. Sometimes a supposed absence of all feeling will be alike the delusion and the distress of the monomaniac. A wife laments that she can no more love her husband or children, and feels as though a heart of stone were in her bosom. The conscience, or religious principle, when diseased, leads to convictions which are very diversified, according to the tendency of the feelings, and the circumstances in which the patient may be placed. One person will be in ecstacies from immediate intercourse with deity; another will be weighed down with the terrible despair of having committed the unpardonable sin, or of being on some other account condemned to eternal misery. When the world believed in demons, monomaniacs possessed with devils, or demoniacs as they were called, were not uncommon; and, when witchcraft was in vogue, the victims of popular delusion not unfrequently shared the vulgar belief in their own supernatural powers. Jealousy imagines that the most sacred obligations have been violated, and fixing the charge, without the least show of reason, upon some innocent individual, pursues him with all the rancour of the most inveterate malice, or the most deadly revenge. Fear thinks itself pursued by justice, condemned to death, beset with enemies.

In many instances, a morbid depression of mind gives rise to illusions, which are of the most diversified character. Allusion has been already made to several which appear to spring from some special passion. Not unfrequently the insane notion has reference to the condition of the frame. The patient imagines himself afflicted with an incurable disease, as syphilis, cancer, &c. He believes that there is a snake, lizard, or other disgusting or horrible reptile in his stomach or bowels. Some have the notion that they have been converted into a brute animal, the sounds and actions of which they imitate. Others entertain some whimsical notion as to their physical condition, believing themselves tea-pots, and assuming a position accordingly, or made of glass, and tremblingly fearful lest they should be broken, or enormously swollen, so that they cannot pass through a doorway. Instances are related in which the patient has even thought himself dead.

The melancholy monomaniac is, in some instances, very excitable, easily impressed by slight causes, fretful and peevish or irascible, disposed to convert every new sound or sight into a source of discomfort, vexation, or alarm, restless and wakeful, and exceedingly communicative upon the subject of his trouble, his terrors, his despair. In other instances, on the contrary, he is obstinately silent, sad, gloomy, or morose, perhaps misanthropic, seemingly concentrated upon his own insane notion, scarcely sensible of changes that are going on around him, and incapable of mental effort, from the apparent absorption of his faculties as well as feelings in the one overwhelming illusion. These are opposite extremes, which often mingle in various degrees, and sometimes alternate in the same individual.

Hypochondriasis belongs to this branch of insanity. In its slighter forms, when consisting only in depression of spirits, connected with functional bepatic, gastric, or intestinal disorder, and not yet associated with any intellectual illusion, its claims to this rank might be disputed. But, when the constant and morbid watchfulness over the health leads at last to some obviously irrational but fixed belief, such as above mentioned, in relation to the state of the body, the existence of animals within it, &c., there can be no doubt of its monomaniacal nature. The hypochondriac is annoyed with pains in the chest and abdomen, especially under the false ribs, which have given origin to the name of the affection. He is troubled also with dyspeptic uneasiness, flatulence, constipation, vertigo or pains in the head, perverted sensations in various parts of the body, imperfect digestion, a furred tongue, a cool and dry skin, a sallow or dingy complexion, cold feet, disturbed sleep, and various other symptoms real or imaginary. But the peculiarity of the affection is the importance attached to the slightest sign of disorder. His countenance has a melancholy or sombre expression; he is always dwelling upon his symptoms; magnifies slight sensations into matters of great importance; imagines that he cannot live; speaks constantly of his health; perhaps goes to his bed, and remains there for weeks, or shuts himself up in his apartment; in short, torments himself and all around him by his unceasing complaints, and the obstinacy with which he resists all kinds of consolation. Nothing affronts him more than to make light of his disorder. At length he is affected with hallucinations, and entertains some ridiculous or whimsically absurd notion of his personal transformation, of what is going on within him, &c., characteristic of true monomania. The affection is probably a mental disease, supervening on neuralgic or otherwise deranged conditions of the digestive viscera. It is frequently associated with deficient action of the liver, or excessive excretion of oxalate of lime with the urine; and, in all probability, sometimes originates in these disorders. It is often remittent, occurring paroxysmally, with regular intervals of comparative health; and is often much aggravated by the abuse of stimulating or narcotic substances, as strong coffee, tobacco, opium, or alcohol.

Sometimes the illusion is not so much one of the judgment or reason as of the perceptive faculty. The patient has visions, sees persons and objects which have no existence, hears imaginary noises. His perceptions of things around him are different from those of health. For a time, perhaps, he may resist the novel impressions, may himself laugh at them as singular, visionary, or absurd. When he believes them real, they become *hallucinations*, and he is insane.

Not unfrequently the illusion leads to some particular course of action, which then constitutes the most prominent feature of the case. Some monomaniacs abstain obstinately from eating, under an insane notion of duty, or an apprehension of evil. Thus, one will suppose that he must fast forty days in imitation of the Saviour, another that poison has been introduced into his food.*

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* *Sitomania* (Σίτος, bread). This invincible determination not to take food is a not unfrequent symptom of various forms of insanity, and requires careful attention, on the part of the practitioner, to prevent the most serious and even fatal consequences. It has recently been specially investigated by Dr. Wm. S. Chipley, who has proposed the name of *sitomania* for the symptom, and whose remarks on the subject are contained in the *American Journ. of Insanity* for July, 1859 (p. 1). The affection may be divided into two groups; one purely moral, in which the digestive organs may be in good order, and the appetite is unimpaired; the other, in which the insane idea is associated with, and probably depends on disease of the stomach, perhaps chronic inflammation, perhaps atony of the organ, which takes away all desire for food, and even renders the idea of it repulsive. In the first group, the peculiar basis of the insane idea is very various in different persons, and requires careful study by the practitioner to enable him to institute appropriate methods of cure. One of the most common sources of the symptom is an insane notion of duty, derived from a supposed special divine command. Another very frequent delusion is that the food is poisoned; and the patient will starve himself to death, in order to escape being poisoned. Analogous to this is a notion, that the dishes served up to him are unfit to eat, being mixed with offensive or unwholesome substances. Some think that they must fast forty days, in imitation of the Saviour. In recent times, since spir-

Others for similar reasons are determinedly silent, having a revelation of duty to that effect, or apprehending some terrible evil, should they speak. A third set retain their excretions from similar absurd convictions, connected with their illusion. But worse than these are the tendencies not unfrequently evinced to suicide and murder. These latter forms of the disease are so common as to have received the designations of *suicidal* and *homicidal monomania*, and are so important as to merit a separate notice.

Suicidal monomania is distinct from the insane suicidal impulse of which I shall treat directly. In the former there is always a motive. The proper maniac scarcely ever kills himself unless by accident. He may jump out of a high window, thinking he is escaping through a door, or may rush into some danger from the notion that he cannot be injured; but he seldom or never makes away with himself from settled purpose.

The motives of the monomaniac are various, and cannot always be discovered. Some commit the act under feelings of despair, or in order to escape intolerable suffering. The monomaniac who believes that he has committed the unpardonable sin, and is condemned to misery both in this world and the next, often kills himself, perhaps in the vague hope that he may better his condition, while he cannot make it worse. Some fly to suicide as a refuge from supposed disgrace, from the fancied pursuit of justice, from the burden of real or imaginary guilt, from physical sufferings which they believe incurable, from the horrors of paralyzed affections and a stony heart, from the overpowering distress of crushed hopes, wrecked fortunes, violated confidence, and outraged honour. In these latter cases, though the sufferer may be in his sound mind in some instances, and perpetrate the act as a matter of calculation, he is probably more frequently in a state of monomaniacal delusion. Not a few destroy themselves under an impression of duty, being commanded to the sacrifice by an intimation from above, or by the consideration of some great good that is to accrue to individuals, or some great evil that may be averted from them, by their death. Sometimes an insane notion of revenge is the apparent motive. The purpose is accomplished in various ways; by hanging, drowning, the pistol, the razor, or poison. The constancy with which the monomaniac cherishes his suicidal intentions, and the skill and cunning which he sometimes evinces in deceiving the watchfulness of his attendants, and providing the means of self-destruction, are truly surprising. Dr. Brigham states that, of 1181 patients received into the New York State Lunatic Asylum, 156, or between a seventh and an eighth of the whole number, were disposed to suicide. (*Report*, Feb. 1847, p. 37.)

Homicidal monomania, though less frequent than the disposition to suicide, is yet not uncommon. In most instances, it is undoubtedly the result of calculation. The maniac sometimes kills another without cherished intention, perhaps without any intention whatever, in the mere violence of his insane fury. The monomaniac generally has a motive. Sometimes this is revenge for imagined injury, intense hatred, ambition, anger, or other evil passion. Sometimes it is fear, which leads him to kill another to escape a supposed danger from his victim. Very often it is a sense of duty. The mother kills

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itualism has been in vogue, the hallucination occasionally consists in an imaginary warning from the spirits. Sometimes there is a vague notion that, by abstaining from food, the patient will prevent some serious evil to himself or his friends. In other instances, the abstinence is a penance for some real or imaginary sin. Some patients refuse to eat because they think themselves dead; others as a means of suicide. Instances occur in which the motive seems to be an insane love of notoriety, especially in hysterical women. The refusal may, moreover, be a scheme to extort a privilege, or to give annoyance. The patient has, in some instances, no hesitation to speak of his convictions; but is perhaps more frequently extremely obstinate in concealing his motives, and much ingenuity is often required in investigating them. The mode of managing these cases will be considered under the head of treatment. (*Note to the sixth edition.*)

her infant children to save them from the misery, or the guilt of this world, and to secure them a place in heaven. The religious enthusiast kills the supposed enemy of his faith; the political enthusiast, the supposed enemy of his party, or his doctrines. Some, there is reason to think, obey an imaginary intimation from above. They suppose themselves mere instruments of a higher power. It is a well-attested fact, that the monomaniac sometimes seeks his own death through that of another. Afraid to rush into the other world with an unrepented sin upon his conscience, he commits murder in order that he may be executed, with the chance of repentance in the mean time, and consequent forgiveness from heaven. Some kill from a principle of imitation, as a child will sometimes hang his companion after witnessing a public execution; some, probably, from a wish for notoriety. It is possible that a mere abstract disposition to kill or destroy may itself constitute the insanity of the patient, without any appreciable motive, and without illusion. This might be moral insanity, or insane impulse, but would not come under monomania as usually defined.

Monomania may terminate in recovery, may continue indefinitely during the life of the patient, or may sink finally, either with or without the supervention of mania, into dementia, paralysis, and death.

5. Insane Impulse.—The existence of this form of insanity, unconnected with moral insanity or monomania, has been doubted; but cases every now and then occur which can be explained in no other way. Persons in the perfect possession of their intellect, with no predominant passion, are seized with an unaccountable propensity to do some insane act, without motive or object appreciable by themselves or others. Sometimes they rush headlong to the act in obedience to the impulse, which takes them as it were by surprise, so that they have apparently no time for resistance. In other instances, the impulse is less immediate and powerful, and the patient is able to resist it for a time, or even to conquer it altogether, or at any rate to hold out against it, until the morbid condition of brain in which it originates ceases spontaneously, or under the influence of remedies. Persons who have looked down over the brink of a high tower, or a precipice, and have experienced a shudder to come over them when the thought of voluntarily throwing themselves into the abyss beneath has forced itself upon their minds, can probably form some faint conception of the mental condition in cases of insane impulse. The tendency is not limited to any particular act, or any number of acts. But it is most striking when it takes, as it not unfrequently does, a violent or illegal direction, as for example, personal assault, homicide, self-destruction, arson, or theft. There is reason to believe that individuals have been frequently impelled to kill others or themselves by this cause. A husband or father, always affectionate and tender in his domestic relations, suddenly seizes an axe and kills his wife or child, and then attempts his own life, but survives long enough to declare that he had acted under a sudden and irresistible impulse, altogether unintelligible to himself. Dr. Woodward relates the case of a young man who consulted him on account of an extraordinary desire which frequently came over him to kill, and which was so strongly excited by the presence of near relations, for whom he had all proper affection, and not the least antipathy, as to make him shudder. The propensity had for a time quite disappeared, upon his engaging in some laborious avocation, but had afterwards returned, and to such a degree that he was under the necessity of frequently leaving the company of a partner in business, to avoid yielding to his horrible propensity. (*Am. Journ. of Insanity*, i. 325.) The late Dr. Jos. Parrish used to relate the case of a young lady, to whom he was called several hours after she had taken a poisonous dose of opium. Though too late to save her, he succeeded in producing a brief return to consciousness, when she assured him that she had no cause whatever for the act, but had been unaccountably seized with a disposition to suicide upon seeing a bottle of laudanum. I once attended a lady, who had taken laudanum to destroy herself, and who declared, after her recovery, that she had been led to the act by reading the account of a suicide by another lady of whom she had some knowledge.

Anatomical Characters.

Some investigations have recently been made into the state of the blood in insanity, but as yet they are very incomplete. Dr. W. C. Hood, aided by Dr. Marcet, has found, from observation in a considerable number of cases, that blood withdrawn during the periods of maniacal excitement, has a considerable deficiency of fibrin, which is repaired during convalescence. M. Wittorf and Dr. Erlenmeyer have come to a similar conclusion from their inquiries. (*Med. T. and Gaz.*, May, 1860, p. 538.) These observations are important, as tending to prove that the violent paroxysms in mania are wholly independent of inflammation.

Very commonly organic derangements of various kinds are found in persons who have died insane, which had no direct connection with the cerebral affection. Such marks of disease are observed most frequently perhaps in the lungs; but frequently also in the alimentary canal; and occasionally in the heart. According to M. Georget, more than half the maniacs who die in the Salpêtrière, are carried off by phthisis. A singular anatomical phenomenon, noticed by Esquirol in numerous cases of melancholy monomania, and by others after him, is an irregular position of the colon, which, instead of passing across the abdomen as in health, descends perpendicularly behind the pubes. But, though most patients are destroyed by other affections than the cerebral, yet evidences are generally discovered of former or present disease in the encephalon. It is said that, in some instances, the brain is perfectly sound; and Esquirol relates the case of a young woman, killed accidentally in a state of recent mania, in whom no lesion was discovered in the brain or its membranes. But, since a closer attention has been paid to the pathological condition of the brain in disease, the number of instances in which no lesion could be traced has diminished; and it is highly probable that many of those, formerly thought to be exempt, would have unfolded some morbid sign to the nice anatomy of the present day.

Not to speak of the anatomical observations of Willis, Morgagni, Greding, Haslam, and Esquirol, which are somewhat contradictory, the results obtained by more recent pathologists, among whom may be mentioned Georget, Bayle, Calmeil, Delaye, Foville, Pinell-Granchamp, Parchape, and Webster, concur in authorizing the conclusion, that the cortical substance, or the membranes, or both, exhibit evidences of previous or existing inflammation in almost all cases of insanity; and, from the statements of Delaye, Foville, and others, it appears that, in those cases in which insanity is complicated with paralysis, besides the affection of the gray matter and the membranes, the medullary substance is preternaturally hard and white.

The following is a summary of the most striking cephalic phenomena noticed in connection with insanity. The cranium is sometimes thickened, and either dense and solid throughout like ivory, or soft and spongy. The cavity, though often quite regular, is in some instances misshapen. The membranes are often diseased. The dura mater is occasionally thickened and adherent. The arachnoid is thickened and opaque, with false membranes in various stages of development within its cavity, and attached to its surface. The pia mater is swollen, injected, red, infiltrated with blood or serum, and often adherent to the brain, portions of which are carried away with it, when forcibly separated. The cortical substance, in recent cases, is reddened, sometimes uniformly and intensely, sometimes in spots or points, with minute infiltrations of blood. In old cases, which have assumed the form of dementia, the spots are of a violaceous hue. Dr. Ecker, of Utrecht, has found the minute cerebral vessels, as seen under the microscope, to be greatly enlarged. The consistence of this portion of the brain is altered, being, in general, preternaturally soft throughout its depth, while it may be somewhat hardened on the surface, where it adheres to the pia mater. The white substance is indurated in paralytic cases. In the advanced stages, the bulk of the brain is often diminished, and minute cavities are sometimes observable in the cortical substance, resulting, as supposed by M. Foville, from former extravasations, but, according to Dr. Sims, from softening. The specific gravity of the brain is said also to be diminished in chronic cases. Serous or sanguineous effusion is often noticed in the cavity of the arachnoid, the ventricles, and the tissue of the pia mater; and serum exists in minute cavities in various parts of the encephalon; especially in the plexus choroides, which, as noticed by Esquirol, generally contains serous cysts resembling hydatids. Serous effusion is a necessary consequence of the shrinking of the brain, which is very common in cases of dementia.*

The general inference from a comparison of all the observations is, that the gray substance is almost always diseased in fatal cases of insanity; and that, in cases complicated with palsy, there is, in addition, the indurated state already mentioned of the white or medullary matter.†

Causes.

Predisposing.—In the great majority of cases, insanity is produced by the influence of exciting causes acting upon a predisposition to the disease. Inheritance is the most frequent source of this predisposition, perhaps more frequent than all others put together. Even a particular form of insanity is often inherited; and it has been noticed that the attack is apt to come on at the same period of life in the parent and the offspring. The tendency to suicide not unfrequently descends from parent to child. It is thought that the children born before the occurrence of insanity in the parent, are less liable to be affected than those born subsequently.

Time of life has much influence over the susceptibility to insanity. Neither youth nor old age is very liable to the disease. The period of greatest susceptibility, according to most European writers whom I have consulted, is between thirty and forty; at least that is the age at which the largest numbers are admitted into the hospitals in England and France. But the numbers of the population are said by Prichard to decrease in greater ratio, with increasing years, than those of the insane, so that in fact these are more numerous in relation to the sane of the same age in advanced than in middle life. In this estimate, however, Dr. Prichard includes senile dementia, which scarcely deserves to be considered as insanity. If this be omitted, it will probably be found that the disease comparatively seldom originates in old age. Under ten years, though insanity sometimes occurs, it is very rare. It is a singular fact, probably to be accounted for by the earlier period at which individuals of both sexes in this country enter into the business and excitement of active life, that the greater number of cases among us occur between the ages of twenty and thirty. This at least is the inference to be drawn from the Reports of the Pennsylvania Hospital for the Insane and the State Asylum of New York.*

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* Of 175 autopsies reported by Dr. John Webster, of London, there was infiltration of the pia mater in 145, turgidity of the blood-vessels in 127, effusion into the ventricles in 120, thickening and opacity of the arachnoid in 62, altered colour of the brain in 45, bloody points on the cut surface of the medullary substance in 82, and effusion of blood in 82, besides various other morbid alterations.—(*Lond. Medico-Chirurg. Trans.*, xxxii. 155.)

† In the general paralysis of the insane, Dr. Baillarger has observed, in a considerable proportion of the cases, a peculiar superficial hardening of the white matter of the brain, immediately in contact with the cortical substance; while, beneath this indurated portion, the medulla was more or less soft, sometimes even to diffluence. (*N. Y. Med. Journ.*, Nov. 1865, p. 156.)—*Note to the sixth edition.*

Sex does not appear, according to the hospital returns, to have any very decided influence. From the researches of Esquirol, it would seem that the proportion of women is rather greater than that of men in Europe; but more extensive returns subsequently collated indicate a slight predominance of males.† It is probable, however, that a much larger number of females are taken care of at their own homes than of males; so that the proportion of the former may be greater than it would appear to be from the returns. Men may be more exposed to the direct causes of the disease; but it may be admitted that there is probably a greater predisposition in women, arising partly from their strongly nervous temperament, and perhaps still more from the influence of their peculiar sexual functions on the nervous system, as menstruation, pregnancy, and the puerperal state.‡

The natural constitution of the individual often predisposes to insanity. Persons of the nervous and melancholic temperaments are peculiarly liable to the disease. So also are those who have naturally any strong passion in excess, as ambition, pride, love of applause, &c.

The rich and cultivated are more subject to it than the poor and ignorant. Their cerebral functions are, from their position and habits, more liable to over-excitement; while the irregular movements of their nervous systems want the control of regular and constant occupation.

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* The following statements will serve to illustrate the text. Of 4409 patients admitted into various establishments in France and England, 356 were between 10 and 20; 1106 between 20 and 30; 1416 between 30 and 40; 861 between 40 and 50; 461 between 50 and 60; 174 between 60 and 70; and 35 above 70. (Georget, *Dict. de Méd.*, xiii. 252.)

Of 2010 patients in the Pennsylvania Hospital, 4 were under 10 years; 233 were first attacked between 10 and 20 years of age; 770 between 20 and 30; 491 between 30 and 40; 382 between 40 and 50; 129 between 50 and 60; 39 between 60 and 70; and 12 above 70. (Kirkbride's *Report* for 1851.)

Of 1181 in the New York State Asylum, 123 were first attacked under 20; 439 between 20 and 30; 299 between 30 and 40; 186 between 40 and 50; 86 between 50 and 60; 44 between 60 and 70; and 4 above 70. (Brigham's *Report*, Nov. 1846.)

It will be seen that, in the first table, the age at the period of admission into the hospital is given; in the two latter tables, that at which the disease began. But, even when compared upon the former basis, the numbers in this country will be found greatest between 20 and 30; for 644 were admitted into the Pennsylvania Hospital between those ages, while 531 only were admitted between 30 and 40. (Kirkbride's *Report* for 1851.)

† From hospital reports both in Europe and America, collated by Dr. Edward Jarvis, it appears that of 125,028 patients, 64,786 were males, and 60,242 females. (*Am. Journ. of Insanity*, vii. 146.)

‡ *Climacteric Insanity*. This name has been given to insanity occurring, whether in women or in men, at a certain period of life, in which changes are thought to be produced in the system, altering its susceptibilities, and disposing it peculiarly to certain diseases. In women this period is about the cessation of the menses, from 40 to 50; in men it is supposed to be somewhat later, between 50 and 60. Among the diseases favoured by this condition of system is insanity. Dr. Francis Skae, of Scotland, has investigated insanity from this cause with much diligence, and has come to the conclusion, that it has peculiarities which characterize it as a special variety of the disease. Of these characters the most prominent are dejection of spirits, alternating at first with restlessness, but at last if continued ending in complete melancholy. The patient, moreover, is apt to be fearful, anxious, suspicious, sometimes dreading the loss of his soul, and not unfrequently disposed to suicide. From the examination of 200 cases of women, and 60 of men, which were treated in the Royal Edinburgh Asylum, he found that the age at which the affection is most apt to occur in women is from 45 to 50, in men about 55. It is an unusually curable form of melancholia; the percentage of recoveries in women being 52, in men 56·7. The duration of the curable cases varies from less than six weeks to more than two years; but by far the greater number of recoveries take place in from four to six months. The most important indications of treatment are to remove the patient from former friends and associations, to institute a watchful course of moral management, to use opium or other narcotics judiciously, and to support the strength by nutritious food. (*Ed. Med. Journ.*, Feb. 1865, p. 704.)—*Note to the sixth edition.*

Vicious education is a powerful predisposing cause. There may be error in two opposite directions. The brain may be prematurely stimulated to exertion by the ambition of the child or the parent; or the evil passions may be allowed to develope themselves unchecked through a weak and injudicious indulgence. In the former case, the cerebral functions are sometimes brought into a state of irritation which requires but a slight additional excitement to become decidedly morbid; in the latter, the character is left unprovided with the due safeguards against the temptations and necessary struggles of life, and the mind sometimes breaks down under the first serious conflict. Premature indulgence, moreover, in every pleasure, lawful or unlawful, wears out the susceptibility to enjoyment, and leaves the mind a prey to ennui, and peculiarly prone to morbid impressions.

Celibacy appears to favour the inroads of insanity. It will be seen, by referring to the reports of hospitals, that the proportion of unmarried inmates is in general much beyond that of the same class of persons to the population at large. It is highly probable, that the agitations and frequent disappointments of the tender affections to which celibacy is exposed, may have some influence in bringing about this result; but a still more powerful cause is probably the want of that perennial source of consolation and encouragement in all the reverses, disappointments, and struggles of this life, which is found in connubial affection. Perhaps, however, the proportion of the unmarried insane in hospitals may not properly represent their relative numbers in the community generally; for, being frequently without the conveniences of a home, and without near friends to take charge of them, they necessarily become inmates of the public institutions.

The profession or business of men has great influence over the number of the insane. The proportion is vastly greater among the classes whose brains are kept in a perpetual turmoil, either of passion or of intellect, than among those who pursue a tranquil course of moderate industry and enjoyment. Rulers, poets, artists, politicians, and professional men are peculiarly liable to insanity. The proportion of physicians in a community is perhaps one to five hundred; yet, in the report of the Pennsylvania Hospital up to the year 1852, we find 22 of them out of 2010 patients, or 1 to about 90.* It has been observed that the number of the insane is greater in a community, in proportion to the political and religions freedom of the population; that is, to the opportunity they enjoy of working out their own purposes, whether in relation to this world or the next, in the manner most agreeable to themselves. Excitement and powerful effort are always greatest in such communities. Perhaps there is no country in the world in which the insane are proportionably more numerous than in our own.

One attack of insanity is often a predisposing cause to another.

Exciting Causes.—These are very numerous. Whatever disturbs the regular supply of blood to the brain, or otherwise morbidly exalts or depresses the functions of that organ, may prove an exciting cause of insanity in the predisposed. A certain degree of these influences may occasion the result without peculiar predisposition. In some instances, the immediate cause of an attack is very obvious; in others, it is altogether obscure; and it is probable that the original proclivity to the disease may be so strong in some, as to induce it in the natural progress of the organization towards maturity and decay, without the intervention of any special cause. The exciting causes are usually divided into the moral and physical, of which the former are much the more frequent, if the effects of other diseases in promoting insanity, such as apoplexy, epilepsy, and febrile diseases, be left out of the question.

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* Perhaps this disproportion may be owing in part to the long-established reputation of the Pennsylvania Hospital, and to the circumstance that most of the inmates pay for their support in the institution. But, in the comparatively new State institution of New York, the number is 10 out of 1181, or 1 to about 118. The number of attorneys is 14, or 1 to about 84, which is vastly beyond their proportion to the community at large, all due allowances being made for the young and the old. (Brigham's *Report*, Nov. 1846.)

Of the moral causes, excessive mental excitement, whether intellectual or emotional, is probably among the most common. Examples of this we have in severe study; perplexing metaphysical investigations; over-indulgence of the imagination; the struggles for power, influence, or wealth; religious and political excitement; violent anger, and excesses of revenge, jealousy, or hatred; the agitations and perplexities which arise from the entanglements and remorse of vicious or criminal indulgence; all kinds of erotic exuberance; the slow tortures of connubial disturbance; and the occasional wearing solicitudes of family relationship and dependence. Nor are depressing causes without a powerful influence. Fear, disappointment, grief, and despair have been fruitful sources of insanity. The reverses of business, the loss of friends, the triumph of enemies, abused confidence, betrayed affections, public disgrace, violated chastity, and general destitution fearfully contribute to fill the asylums for the insane. Times of great public excitement, whether of business, war, politics, or religion, are usually attended with a marked increase of the disease. Independently of the rational agitations of such occasions, there is generally added a diseased, almost electrical enthusiasm, arising from the friction of mind against mind, amid these tumultuous movements. But it is a singular fact that, in our Northern States, a considerable diminution took place in the inmates of our insane asylums, during the continuance of the late war. (*Am. Journ. of Med. Sci.*, April, 1866, p. 488.) The prevalence of a speculative or gambling spirit in a community, with its sudden accessions of fortune, its unbounded hopes, its short-lived triumphs, its rapid fluctuations, and fearful reverses, leaves many a mental wreck behind when it subsides. Revolutionary struggles, insurrectionary violence, and fearful political commotions strew their course with the ruin of mind, as well as of body and estate. The terrors of false prophecy, and the enthusiasm of new religious creeds, sweep every now and then over communities, and whirl along many an excitable mind into the abysses of madness. The imitative principle often leads to insane acts, if not to insanity itself. The reading of murders and suicides, and all kinds of criminal violence, has tended, I have not the least doubt, greatly to augment the numbers of such deeds.

The physical causes are insolation, injuries to the head, long watchings, vicious indulgences, excessive venery, masturbation, intemperance in drinking, the abuse of opium and tobacco, violent pain, the transfer of rheumatic or gouty irritation, the suppression of wonted discharges, constitutional syphilis, the change of life in women, the puerperal state, the retrocession of eruptions, the healing of old ulcers, and certain morbid states of the brain or other parts of the system, as apoplexy, epilepsy, fevers, hepatic and gastric disease, and various irritation of the intestinal mucous membrane.

Of these causes some act in a peculiar manner, giving rise to certain forms of insanity rather than others, or impressing a peculiar character on that which they excite. Of the moral causes, those of a depressing nature are apt to induce dementia rather than mania, or at least to impress a tendency to the former state of insanity upon the mind. Causes calculated to excite some particular passion, as ambition, intense avarice, jealousy, revenge, love, &c., give an especial tendency to monomania; and the same may be said of the principle of imitation.

Of the physical causes, those of an exhausting character, as venereal excesses and masturbation; and those which derange the organization of the brain, as chronic meningitis, epilepsy, apoplexy, and tumours, occasion dementia either primarily or ultimately, and, in almost all cases, if they do not produce full dementia, give a taint of weakness to the cerebral disorder.

Diseases of the stomach and liver dispose to the melancholy forms of madness, and especially to hypochondriasis, or other gloomy condition of monomania. Nothing is more common than to see a depression of spirits approaching to mental derangement consequent upon functional disease of the liver; and the superaddition of a delusion or hallucination converts the affection into insanity. Such affections occasionally clear off like mists before the sun, under the use of mercurial alteratives. The same observation may be made of cases of oxaluria, which yield most happily to nitromuriatic acid.

Alcohol, by its stimulant impression on the brain, may call a predisposition to the ordinary forms of insanity into action; but there is a condition of brief and often violent madness, continuing for two or three weeks, and then subsiding spontaneously, or under judicious treatment, which alcoholic drinks in excess almost uniformly induce in certain individuals. This is wholly different from delirium tremens, which so frequently results from the abuse of these liquors. The latter is consequent upon a suspension of their use, and is a debilitated condition of the brain; the former is the result of direct stimulation, and is a strongly excited condition of the organ. There is another morbid state of mind, connected with the use of alcohol, differing from either of the above. It is, however, not the result of the stimulant, but antecedent to its use on any particular occasion, and consists in a morbid and irresistible craving for it, coming on at times, and constituting a sort of monomania, or perhaps insane impulse.

The name of *puerperal insanity* has been conferred upon the disease in women, when connected with child-birth. Pregnancy may serve as a cause of insanity, but rarely, except in those slight forms in which certain longings are so strong and whimsical as to merit the name. But the state which supervenes upon delivery is a not unfrequent source of the disease. It most frequently occurs within a few days after the birth of the child, though it may happen at any time during lactation, and even after weaning. Of 92 cases referred to by Esquirol, 37 were within the first two weeks, 17 between this period and two months, 19 from the end of the second to that of the twelfth month, and 19 after the child was weaned. It occurs more frequently in the first than in any subsequent delivery. (*Simpson.*) There is nothing peculiar in this form of insanity except a greater tendency to general prostration than is ordinarily met with; so that the disease will seldom bear depletion, and generally requires a supporting treatment. Dr. H. L. Hodge informed the author, that he had observed a groundless aversion to the nurse, to be among the first symptoms of insanity exhibited by women in this condition.*

Nature.

In relation to this subject, the author wishes it to be understood that he believes fully in the existence of the soul, as something entirely distinct from the body, which is merely its instrument for the accomplishment of certain great purposes in the general economy. But, as this principle operates through the brain, and exhibits its derangements only through alterations in the state or actions of that organ, we may, without giving just grounds for the imputation of materialism, consider the various phases of disordered mental action simply as morbid cerebral phenomena. Now there is good reason

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* Sir J. Y. Simpson believes that there is a strong relation between puerperal mania and Bright's disease of the kidneys. Albuminuria, he says, precedes or attends the access of this form of insanity. He has himself noticed it in 8 out of 10 cases examined. It is a singular fact that the coagulability of the urine in general rapidly disappears after the disease has become confirmed. When there are successive paroxysmal attacks of the insanity, each is preceded by albuminuria, which afterwards soon ceases. (*Med. T. & Gaz.*, Sept. 1860, p. 201, &c.)—*Note to the sixth edition.*

to believe, though the fact cannot yet be sai
strated, that all the cerebral functions conn
performed by the cineritious or cortical matt
matter serves only as the medium of commun
of the body, or between different portions
thereby associating its actions harmoniously.
orders in the primary mental phenomena mu
the cortical substance; and, at most, disease
by deranging the associations of mental actic
impairing the communication of the mind wi
the exterior world. It is, therefore, chiefly
brain that we are to look for the seat of ins
of cadaveric examinations has recently beer
leaves any permanent signs, to discover the
while lesions of the medullary matter have
where the reciprocal action of mind and body
of sense and motion.

But what is the pathological condition o
occasions the symptoms of insanity? This i
answered, in the present state of our knowl
norant of the mode in which the brain acts in
But we can advance a certain distance. One
of the symptoms of deranged cerebral action
vated as by a depressed condition of the orga
sible to determine, by any peculiarity of the p
selves, in which of these conditions they origi
the case with those derangements of function
the name of insanity. They may be mere sym
of action in the cortical substance.

We might expect insanity, therefore, as a
flammation of the cineritious structure; and
stage, and the results of dissection, prove tha
exist. Whenever insanity commences with
anorexia, &c., and the phenomena cannot be
fection, the strong probability is, either that
inflamed, or that it is irritated by inflamma
question now occurs, does this inflammation
gress of the case? Are the symptoms of in
and years, and a whole lifetime, an evidence
This question may be confidently answered in
the cerebral inflammation undoubtedly conti
these cases, there is some other derangement
rapid deterioration of the mental powers; t
case may be, passes speedily into dementia;
show that the disease has invaded the med
stances, when the symptoms of physical excite
left with his general health little impaired, a
sides the psychological phenomena to indicate
times patients continue in this state, with l
of a long life, and die at last of some disease
is impossible that, during all this period, th
inflammation. The fact probably is, that t
wrong direction from the disturbance of the
the mental actions becomes dislocated; and t
machinery, the whole working of the instrume

athological condition may have ceased entirely. Something like this we onally witness in other organs, which acquire a perverted action during mation, that remains long after the inflammation has disappeared. That slight disturbance in the brain is capable of impressing a new character its actions, is shown by the total psychological change produced by va- nervous affections, and especially that usually, though very erroneously, inated the magnetic sleep. Therefore, though insanity may often begin nflammation, or high vascular irritation of the cineritious matter of the and though it may sometimes continue to be associated with that affec- a chronic form for months or years, and at length terminate in death from al lesions, yet much more frequently there is nothing but a perversion of ebral functions, left behind by the original affection. In general, the of the initial inflammation, when it exists, is moderate, bearing to ordi- acute meningitis a relation similar to that which subacute rheumatism to the acute, and seldom producing fatal disorganization in its acute form. insanity is not always inflammatory, even in its early stage. Many cases in which little or no evidence is afforded of any reaction of the cerebral e upon the system at large. The original cause of the malady has been ent, by its direct influence, and without an intermediate inflammation, to rt the cerebral functions, as we see them perverted by similar influences day in hysteria and in artificial somnambulism; the difference being that, latter affections, the perversion is temporary. They who have witnessed rious workings of the so-called animal magnetism, must have been some- struck with a certain resemblance to insanity, in those cases in which the it is free from stupor; and no one would hesitate to pronounce such cases ity, were they to become chronic.

n influences of a sedative or depressing character may produce mental gement, without any attendant evidence of inflammation or even vascular ment, except the simple psychological disorder; and to admit this as a nt evidence of it would be to beg the question.

occasional sudden changes from long-continued unmitigated insanity to ectly sane state of mind, though admitted to be rare, prove that, in such at least, there was mental disorder without inflammation; for it is impos- to conceive that a long-continued chronic inflammation should cease at and leave no trace behind it; and, if the existence of insanity without complication be admitted in one case, it may fairly be considered as prob- in all which present no other evidence of inflammation. The decision of uestion is of something more than speculative interest. It has, indeed, therapeutic value; for one who believes that insanity is in all cases con- with cerebral inflammation, will scarcely be able to receive, with an un- diced mind, evidence in favour of those plans of treatment which conflict his theoretical views.

me have placed the seat of insanity in the viscera of the chest or abdo- It is highly probable, nay, it may be considered certain, that disease ese viscera sometimes induces insanity. Nor does this appear strange, we consider that every part of the system is probably connected with centre in the brain, which receives impressions from its altered state, acts accordingly. It is only singular that the centres, which are thus the ant recipients of morbid impressions, should not in consequence be them- s more frequently disordered. But, though the cause of the cerebral gement may thus reside in some distant organ, the real pathological con- from which the insane movements directly proceed is undoubtedly cere- and exclusively cerebral. Thought and emotion, so far as the material is concerned, are the products of the brain alone.

Diagnosis.

The complaint with which insanity, in the form of acute mania, may be most easily confounded, is ordinary acute meningitis. Indeed the two affections scarcely differ in character, unless in the greater violence of the meningitis, and its more especial direction to the membranes of the brain. In meningitis, the disease probably commences usually in the membranes, and thence extends to the brain; in acute mania, probably in the cortical substance of the brain, whence it may reach the membranes. The former disease begins, as a general rule, more abruptly, exhibiting greater violence of headache, more intolerance of light and sound, a higher degree of fever, more tendency to convulsions and coma, greater general prostration, and a more rapid course than the latter; and much oftener ends in speedy death, or speedy recovery. In the great majority of maniacal cases, the gradual advance of the symptoms, and the comparatively little disturbance of the constitution, leave no room for doubt. In some instances, it is impossible to decide with certainty until after the subsidence of the febrile symptoms, when, if derangement of mind remain, the case may be considered as insanity; if it disappear entirely, it may be ranked as simply acute miningitis.

Between certain cases of insanity and chronic meningitis there is absolutely no difference. When a case begins as mania or monomania, with some febrile excitement, then passes into dementia with paralysis, and ends fatally in the course of a few months, or at most two or three years, dissection will almost always reveal evidences of lesions in the meninges and cortical substance of the brain, with induration, probably, of the medullary structure.

Another affection with which insanity may be confounded is the *delirium* of fever. Generally, there is little difficulty in the diagnosis. Fevers begin more abruptly than insanity, exhibit various other evidences of disease in the head and elsewhere before the appearance of mental derangement, have peculiar characters of their own by which they can generally be recognized, are attended with much greater prostration of the general strength, and run usually a special course. The delirium of fever, moreover, is generally different from that of insanity. It is more frequently attended with disordered perception, is oftener complicated with stupor, and wants that expressiveness of countenance, which, in insanity, so strongly marks the fluctuating state of the thoughts and feelings. Nevertheless, there is occasionally in febrile diseases a delirium which very closely resembles insanity; so that time alone can decide whether it may not belong to the latter affection. I have seen an attack of enteric or typhoid fever presenting so exactly the mental characters of insanity, that it seemed as if the fever must have supervened upon the latter affection; which, however, I was assured was not the case.

It is sometimes important to distinguish insanity from *delirium tremens:* but the reader is referred to the latter disease for the diagnosis.

The question as to the existence of insanity in a particular case is often difficult of solution; and sometimes it is impossible to come to a positive conclusion, because no precise line can be drawn between sanity and insanity; the two conditions running into each other by insensible gradations. Space does not permit a consideration of this question in its medico-legal relations. For medical purposes, the good sense of the physician will generally enable him to decide with sufficient certainty. A prominent consideration should always be, in doubtful cases, the previous condition of the patient. If the peculiarities which attract attention have characterized all his previous course of life, the presumption would be in favour of mere natural eccentricity; if they can be shown to have begun at a certain period, and especially if they have followed some great misfortune, or some great excitement, or an attack of acute disease, they may be referred with confidence to insanity. The knowledge whether the patient was descended from insane parents or grand-parents, and whether he had suffered from a previous attack of insanity, will also aid much in the diagnosis.

It has already been stated that monomaniacs often show great skill in concealing their insane peculiarities, when upon their guard. The physician is frequently called on to decide in these cases. My duty as one of the physicians of the Pennsylvania Hospital was formerly to see each patient, supposed to be insane, before admission into the institution, and certify as to his sanity. In doubtful cases, my plan was first to learn from the friends of the patient his peculiar insane notion, and then, in my inquiries, to keep his attention so long directed towards that particular subject, that he would find it impossible to resist the strong internal impulses, which prompted him to speak in accordance with his feelings or convictions. Thus, I once understood from the friends of a patient that his delusion consisted in supposing himself the possessor of high political office. He was thoroughly on his guard, and quite ready to speak with me on all subjects. I conversed with him at first on indifferent matters, then gradually approached the subject of the elections, and took occasion to ask him how he would like to be appointed to a political office. He answered very rationally that he would have no objection, if the people should think him competent. But, after a long conversation upon subjects of this kind, to which I endeavoured to confine his attention, he at length assumed a confidential air, and informed me that the acting president of the United States had no right to his station, as another person had been really elected; and finally ended by assuring me, in answer to my questions, that he was himself the chosen candidate.

It should be remembered, in our inquiries as to the existence of insanity, that patients often have lucid intervals, in which it is difficult or impossible to detect any trace of their disease; and a decision, therefore, should be avoided, until they have been seen on different occasions; and sometimes it is necessary for the physician, in forming his own judgment, to rely upon the testimony of others.

In relation to moral insanity and insane impulse, a just decision is often still more difficult than in cases of monomania with one steady illusion. Men so often act insanely under the influence of misguided opinion and excited passions, that the physician should be very cautious in coming to a conclusion. When the tendencies of the irregular feeling or impulse are materially to injure the person of others, or of the affected individual himself, the judgment should perhaps incline to insanity, so that the proper guard may be exercised; if the tendency be quite innocent, it may without harm pass for mere eccentricity of feeling. The question as to the origin of the peculiar state of feeling, and the circumstances of its first appearance, should in this form of insanity, as in monomania, be allowed some weight.

The question as to whether insanity has been feigned or not, is so purely medico-legal, that it may be very properly left for works upon medical jurisprudence.

Prognosis.

Under this head may be considered the general mortality of the insane, the proportion of those who recover, and the circumstances which authorize a favourable or unfavourable prognosis in any particular case.

In relation to the general mortality, it is very difficult to arrive at the truth from the reports of hospitals; because in most of these institutions the inmates are frequently changing, and few comparatively of the chronic cases remain till their termination in death. But there can be no doubt that, even where insanity does not directly destroy life, it has the general effect of shortening it by the depravation of system which it occasions in various ways. Esquirol estimates the mortality of maniacs to be one in twenty-five annually, of monomaniacs one in sixteen, and of those affected with dementia one in three. It may be doubted whether the proportion for the first division is not too small, and for the last too large.

The proportion of recoveries from insanity, judging from the reports of the hospitals, varies from about one-half to one-fourth of the whole number. The proportion must differ in the different establishments, not only according to the mode of management, and the greater or less completeness of the proper arrangements, but very much also with the plan adopted in relation to admission and permanent residence; some receiving only those supposed curable, and dismissing them when beyond hope of favourable change, while others admit all indiscriminately, and retain them during life. This may account for the differences of proportion above stated. Of 19,516 patients admitted into different English hospitals, 5918 were cured; of 12,592 received at the Bicêtre and Salpêtrière in France, 5075 were restored to reason. (*Dict. de Méd.*, xiii. 321.) In the best English asylums, as in the Retreat near York, the proportion of cures is about one-half. Of 2010 patients admitted into the Pennsylvania Hospital up to the year 1852, 950 were cured; and if 216 remaining at the date of the report, whose cases were not yet determined, be deducted from the whole number admitted, it will be perceived that the proportion of cures is more than one-half; without calculating a considerable number who left the hospital much relieved, and afterwards recovered.*

But these reports do not afford a just criterion of the real curability of insanity. A large proportion of the cases admitted are old, and quite beyond all hope of cure. It is now a universally admitted fact, that insanity is curable in proportion to the early commencement of a suitable treatment. "Of all who are attacked with insanity, and subjected, during its early stages, to a judicious treatment faithfully persevered in, at least eighty per cent. will probably recover." (Kirkbride, *Report of Penn. Hosp.*, A. D. 1846. p. 9.) Dr. Charles Evans, formerly attending Physician of the Friends' Asylum for the Insane, near Philadelphia, informed me that, of the recent cases admitted into that institution during ten years, the recoveries averaged nearly eighty per cent. Many recoveries take place in the first year, fewer in the second, still fewer in the third, and each year afterward the number diminishes.† After ten years there is little to hope; though recoveries have taken place at a much later period; and efforts should never be abandoned; as cases apparently the most desperate have terminated favourably; and, where cures cannot be effected, much can be done to render the patient more comfortable, and widen the sphere of his enjoyments. The average duration of the curable cases of insanity is stated by Pinel at five months for mania, and six months for melancholy or monomania. Esquirol makes it somewhat longer, but under a year.

Mania is more readily curable than monomania, and this than dementia. Puerperal mania, if it do not destroy life, ends favourably in the great majority of instances. Sir J. Y. Simpson, of Edinburgh, is under the impression that two-thirds of all attacked recover within six months, but a considerable number become permanently insane. (*Med. T. & Gaz.*, Dec. 1860, p. 549.) Debility is most to be dreaded in this form of insanity. Great prostration, a very frequent pulse, and much restlessness are unfavourable symptoms. Moral insanity, without delusion, is apt to be very obstinate. When insanity appears to be merely an exaggeration of some striking natural peculiarity, the prognosis is not favourable. The insanity of epilepsy or apoplexy, or that associated with paralysis, seldom ends in recovery. The young are more curable than the old. The most favourable age, according to Esquirol, is between twenty and thirty, and few comparatively recover after fifty. Inherited insanity is less easily and permanently cured than that arising without such predisposition. Cases of sudden attack are in general more apt to get well than those in which the disease comes on slowly and insensibly. Relapses are said to be more difficult of cure than original cases. The re-establishment of health, with a tendency to grow fat, without any improvement in the mental symptoms, is unfavourable.

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* In the report of the same institution for 1865, the whole number of those admitted up to the date of the report was 4886, and the number of cures was 2118, almost precisely the same proportion as given in the text. (*Note to the sixth edition.*)

† Of 2005 cases considered curable in the Salpêtrière, 604, according to Esquirol, were cured in the first year, 497 in the second, 71 in the third, and 46 in the seven years which followed, in all 1218 in ten years. (Esquirol, *Des Malad. Mentales*, i. 92.)

Treatment.

In relation to the treatment of insanity, a point of great importance, and one which must engage an early attention, is to place the patient under circumstances most favourable for a cure. The question must be promptly decided, whether he is to remain under the immediate care of his family and friends, or to be placed in one of the public institutions, which the advancing humanity and civilization of the times have provided for the shelter and treatment of the insane. As a general rule, there can be no doubt that a residence in a well-conducted establishment of this kind is conducive both to the comfort and restoration of the patient. Persons affected with insanity are very apt to contract aversion for their nearest friends and relatives, and are consequently liable to perpetual irritation from their presence. Instead of being soothed by their kind offices and affectionate attentions, they are often excited into paroxysms of rage; and the best directed measures fail entirely, because counteracted by the injurious influence of those through whom they are administered. Besides, the patient often requires control. Opposition to his will is absolutely essential. But such opposition and control from persons from whom he has before experienced nothing but kindness and perhaps submission, as his judgment cannot appreciate their motives, become sources of perpetual vexation, and sustain an excitement highly calculated to aggravate and fix his disorder. For these and other reasons, separation from family and former friends is almost universally recognized as one of the most essential rules of treatment, in relation to the greater number of cases. With the wealthy, such an isolation is often attempted in their own homes, or at least in a private manner. But this plan is liable to objections. The anxiety of affection is a never-failing temptation to break through the restrictions, which are therefore seldom well observed; and, even when they can be maintained, there is no little danger of abuse of power, on the part of the often mercenary and ignorant guardianship to which the patient is entrusted. Besides, it is of the first necessity to separate the patient from the causes of his disease, which are often connected with his own home, and from everything that may have a tendency to produce impressions, or awaken associations coinciding with the morbid feeling or train of thought. All these considerations indicate a public asylum as the proper abode of the lunatic. But there are others of great weight. It is only in such establishments, that all the measures which experience has shown to be advantageous in the cure of the disease can be brought efficiently into operation. Placed as they usually are under the care of experienced physicians, who have directed an especial attention to the subject of insanity, and whose whole time is devoted to the inmates of the institution, they afford peculiar advantages in relation to medical treatment. Much of the success in the management of insanity depends on a knowledge of the peculiarities of each case, and a proper adaptation of means to these peculiarities; a result which can generally be secured only by a degree of special attention unattainable in the ordinary course of medical practice. Another important consideration is, that, in these institutions, nurses and other immediate attendants upon the sick are trained to the business, and have learned to treat the insane with the least offence to their irritable feelings, and to exercise the necessary control with the least amount of force. The powerful influence of the imitative principle of our natures, which, as before stated, is one of those that suffer least in insanity, can be most advantageously applied in these institutions. In no other situation can so effectual a guard be placed over the suicidal propensity, so common and so fatal among the insane.

It is true that such institutions are liable to abuse; and, in former times, mad-houses were notorious as scenes of the most inhuman neglect or violence. But they were then looked on merely as receptacles of the insane, to keep them from injuring others, and in many instances were little better than prisons. Now, they are hospitals for the cure and comfort of their inmates. Open to public inspection, and with the watchful eye of self-interest upon them, they are much less liable to abuse than formerly. The interest of the superintendents is coincident with their duty. Stated reports make the condition of the institutions known to the public, and a praiseworthy regard for the general good opinion, renders their directors solicitous of so managing the internal concerns of their respective establishments, as to be able to present a fair view of their efficiency to the world.

But, in order that the greatest good may flow from hospitals for the insane, it is desirable that the public should be impressed with the importance of sending the patient to them in the early stages of his disease, and of not removing him prematurely, before the cure is thoroughly accomplished. After the first two or three months of insanity, the longer a proper course of treatment is postponed, the less is the chance of success. While of those treated correctly from the beginning four-fifths may recover, only one-fourth, one-third, or at best a little more than one-half of the general average of admissions into the hospitals end favourably, because too often introduced at a late period of the disease. The cure of insanity is almost always slow and gradual, too much so often for the impatience of friends, who do irreparable mischief by a too speedy removal. The disease, moreover, is exceedingly liable to relapse, unless quite eradicated before the patient is again exposed to the dangerous influences of an unrestricted intercourse with the world. Convalescence should be decided, and all evidence of the existence of insanity should have ceased for weeks, as a general rule, before the patient should be permitted to leave the institution.

But, while thus advocating a recourse to the public institutions, I do not wish to be understood as recommending it indiscriminately. On the contrary, there are many cases which are best managed at home. In the acute stages of insanity, when there are evidences of inflammation of the brain, and constitutional disturbance enough to make it most prudent that the patient should keep his bed, the disease will be best left to the ordinary course of domestic nursing, and regular medical attendance. The necessary means can generally be effectively employed at home; while the exposure and agitation of a removal may be productive of serious injury. Should insanity remain after the inflammatory symptoms have subsided, resort may then be had to the public institutions. There are, moreover, not unfrequently cases of such a nature, especially among females, as rather to be benefitted by the kindly and cheering influences of home and the society of friends, than to be injured; while the subdued and quiet character of the affection renders little or no restraint necessary. In such instances, the best situation for patients is in the bosom of their family; and a residence among strangers might aggravate the disorder.

Three prominent indications present themselves in the treatment of insanity; *first*, to remove the causes; *secondly*, to correct all discoverable physical disease, whether in the brain or elsewhere; and, *thirdly*, to rectify the perverted cerebral function.

1. *Removal of the cause.*—Immediate attention should be paid to the cause of the disease. This has sometimes ceased to act, and therefore requires no other consideration than as a knowledge of it may contribute to a better understanding of the case. But very frequently it continues in full force, and by its influence serves to sustain and aggravate the disease; or, if the patient is removed by the violence of his insanity temporarily beyond its reach, lies as it were in wait for any returning glimpse of reason, prepared again to strike down its victim as he rises. Its removal, under these circumstances, should be one of the first cares of the physician. If this be impossible, the next object should be to withdraw the patient from its influence until his health is confirmed. If neither object be attainable, efforts should at least be made to obviate its influence as far as circumstances will permit. It occasionally happens that the mental wound heals immediately, when the thorn is extracted. Among the greatest advantages of separation from old association, and seclusion in an establishment for the insane are, that the patient is thus placed beyond the sphere of influences which had contributed to produce and sustain his disease, and, if the cause consist in some personal vice or injurious habit, that opportunities are thus afforded of correcting the evil, which could not be commanded under the patient's own roof. It is unnecessary to repeat here the particular circumstances requiring attention. They have already been sufficiently considered under the head of the causes.

2. *Removal of existing physical disease.*—Whenever, in the early stages of insanity, the symptoms put on the characters of acute meningitis, there should be no hesitation in adopting an antiphlogistic course, proportionate in degree to the apparent violence of the inflammation. The treatment should be in all respects that already recommended in the same pathological condition, existing independently of fixed insanity. (See *Acute Meningitis.*) Bleeding, general and local, active purging, cold to the head, and, if the disease should tend to the comatose state, after due depletion, a blister over the whole scalp, and mercury given with reference to its influence on the system, are the chief remedies. Not only may a fatal termination of the disease often be averted by the energetic use of these measures, but, in cases which might possibly not prove immediately fatal if more leniently dealt with, the establishment of chronic insanity, with or without attendant chronic inflammation of the brain and meninges, may in some instances be prevented. I am confident that I have witnessed such results.

But here it is necessary to place the reader upon his guard. There are comparatively very few cases of commencing insanity which present symptoms of acute meningitis so violent as to require very energetic depletion. In the great majority of cases, if there be evidence of cerebral inflammation at all, it is comparatively mild, and requires corresponding mildness in the treatment. The proper therapeutical rule is to be guided by the condition of system, very much as though there were no symptoms of insanity, allowing to this phenomenon simply the weight of an indication, that the local cause of any general disturbance which may exist is probably in the brain. When, therefore, in the early stage of acute insanity, increased frequency and force of pulse, increased heat of skin, a furred tongue, anorexia, constipation, and other symptoms of febrile excitement exist, which can be reasonably referred to no other cause than the cerebral disease, the patient should lose more or less blood, should be purged more or less frequently, and treated in other respects more or less actively by the antiphlogistic method, according to the degree and energy of the excitement, independently of the mere mental derangement. Should the excitement be slight, bleeding may be dispensed with; and should no febrile action whatever exist, as not unfrequently happens, antiphlogistic measures may be altogether unnecessary.

To bleed and otherwise deplete copiously for insanity alone, even in its early stage, is, I am convinced, a hurtful practice. Without having the least influence over the delusions of the patient, it lowers the grade of his vital force, and renders him less able to support the more or less wearing influence of the mental disease on the bodily health. It is even thought by some to dispose to a more rapid decline of mania or monomania into dementia; and to diminish the chances of a subsequent cure, or at least to protract the duration of the disease. Dr. Kirkbride, the intelligent superintendent of the Pennsylvania Hospital for the Insane, informs me, that depletion is in his estimation the great error in the primary treatment of insanity. It is not uncommon to mistake some frequency of pulse, which may be the result of mere functional disturbance of the brain, for an indication of active febrile excitement; and the violent maniacal paroxysms as proofs of cerebral inflammation. There can be no greater error than these. The pulse is often accelerated by the want of sleep, and the various agitation of the patient, without fever or inflammation, and indeed may, in many instances, be most happily composed by opium and other cerebral stimulants, which under the contrary supposition could do only injury. The maniacal paroxysms, though frequently attended with signs of general excitement, occur as well in debilitated as in elevated states of the system, and may be quite compatible with a stimulating or supporting treatment. Instead of being relieved, they are in some instances aggravated by the loss of blood. The practitioner should draw his inferences as to the condition of the brain, whether inflamed or not, from other sources than these. To justify the use of depletory measures, the excitement of the circulation should persist in the intervals between the paroxysms in a greater or less degree; the pulse should be strong as well as frequent; and other signs should exist of the reaction of the inflamed brain upon the system, such as a furred tongue, deficient appetite, deranged secretion, &c. When the pulse is feeble and compressible, though frequent; when coolness or other marks of deficient capillary circulation in the extremities exist, with general relaxation of the surface and copious sweats; and when nervous tremors like those of delirium tremens are observed; however violent may be the phenomena of insanity, blood should either not be taken at all, or should be abstracted with great caution, and only by cups or leeches.

Supposing that depletion has been called for by the existence of inflammation or high vascular irritation of the brain, it should be abandoned as soon as the symptoms indicative of these pathological states have been subdued, though the insanity may remain unabated, and the patient exhibit, on frequent occasions, all the signs of maniacal fury which may have at any time marked the paroxysms.

Very different opinions have been given by persons of great experience and high authority as to the propriety of bleeding in insanity. Thus, Haslam, Rush, and Foville strenuously advocate this remedy, while the equal authority of Pinel and Esquirol is against it. The inference is, that there is good and evil in the remedy; and that the difference of opinion has probably arisen from too exclusive a direction of the attention to one or the other of these qualities. Bleeding may undoubtedly often do much good. Reason and experience both abundantly prove that it is very often unnecessary, and may sometimes be essentially injurious. The rule will bear repetition that the mere existence of insanity, however violent in its exhibitions, should never be admitted as a reason for bleeding, any more than delirium, coma, headache, or any other sign of cerebral derangement. It is only when the mental disorder is associated with signs of active vascular irritation or inflammation that the remedy should be appealed to; and then it should be employed with an energy proportionate to the violence of the symptoms. The reports of those hospitals in which bleeding has been entirely abandoned, and in which great success is claimed for an opposite mode of treatment, must not be allowed undue weight in the decision as to the propriety of the measure. Cases have usually advanced beyond the period at which active depletion is advisable, before they are sent to these establishments. When doubts may exist as to the propriety of using the lancet, local bleeding may be substituted.

Purging has always been a favourite remedy with some practitioners. It was much employed by the ancients, and the use of hellebore in insanity passed into a proverb. It is certainly a useful adjuvant of the lancet in cases attended with cerebral inflammation; and, in those of a milder character, but still offering some degree of general excitement, may with great propriety be employed as a substitute. Calomel, compound extract of colocynth, the compound cathartic pill, senna and salts, jalap and bitartrate of potassa, &c. may be used in the earlier stages and severer cases; sulphate of magnesia, or some other saline cathartic, in those of a milder character, and when a frequent repetition of the remedy is desirable. Many cases of commencing insanity may be advantageously trusted, during the stage of general excitement, to a dose of one of the purgative salts every day, every other day, or less frequently, according to the circumstances of the case, along with a proper regulation of the diet. Even in those instances in which no general excitement exists, or in which signs of debility may be evident, as constipation is a frequent attendant, and as the irritation of fecal accumulation acts injuriously on the brain, it is often best to employ cathartics; but in such cases the non-depletory laxatives should be preferred, such as rhubarb and aloes.

In febrile conditions, with a hot dry skin, the antimonials and refrigerant saline diaphoretics may be used, in conjunction with the warm bath, which is here a valuable remedy. When, along with this febrile state, there is much paroxysmal violence, advantage will often accrue from nauseating doses of tartar emetic or ipecacuanha. The sensation of nausea has a powerfully repressing effect upon cerebral excitement. The highest fury of the insane paroxysm is not unfrequently quieted down into calmness under this influence. One or two grains of tartar emetic, or from five to ten grains of ipecacuanha, may be given every two, three, or four hours until no longer required; or smaller quantities may be employed if found to answer.

Cold to the head is a valuable remedy in some cases of great vascular irritation or inflammation of the brain. The hair should be removed, and ice or cold water applied as mentioned under meningitis. Sometimes advantage accrues, especially in instances of violent maniacal excitement, from directing a small stream of cold water upon different parts of the scalp, through a flexible pipe. The effect will be increased by immersing the feet at the same time in hot water, and thus producing revulsion towards the extremities.*

Should the disease appear to take on the form of chronic inflammation of the brain or its membranes, after depletion general and local has been carried as far as circumstances appear to warrant, an attempt should be made to arrest its progress by blisters over the whole scalp, repeated if necessary, and the production and maintenance, for a considerable time, of a moderate mercurial impression. Blisters to the scalp are especially useful when there is a strong tendency to stupor or coma. They are greatly preferable to the same remedy applied to the back of the neck, or between the shoulders. Small blisters placed upon the crown of the head can have little effect. To be really useful, they must cover the whole scalp. I have seen the greatest apparent benefit from the remedy in this state of insanity. Some recommend issues and setons; and an issue in the top of the scalp, over the sagittal suture, is thought to have been very beneficial in some instances of dementia with a comatose tendency.

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* M. Briére de Boismont recommends, as extraordinarily effectual in the treatment of acute mania, the immersion of the body in a bath for five, ten, or even fifteen hours, combined with continuous cool irrigation of the forehead. By this plan he asserts that the disease may be cured in one or two weeks. (*Braithwaite's Retrospect*, xvii. 60.)

But there are other morbid states, besides that of cerebral inflammation, which complicate insanity. These should be carefully observed, and treated upon principles applicable to ordinary cases presenting the same characters. The digestive organs are often deranged. Dyspepsia and constipation sometimes require the use of mild tonics and laxatives, with a properly regulated diet, and exercise in the open air. Chronic gastritis or chronic enteritis may be coincident with the disease, and possibly contribute to sustain it. They should be treated as elsewhere directed for the same affections. The functions of the liver are very frequently impaired, and demand the use of the blue pill, nitromuriatic acid, taraxacum, &c. A morbid dryness and inactivity of the skin require the use of the warm or hot bath, and friction to the surface. Excessive action of the heart should be controlled by digitalis, American hellebore, or medicines containing hydrocyanic acid. General debility should be corrected by tonics, the cold or shower-bath, exercise, and nutritious diet. Anemic patients should be treated with chalybeates. Derangement of the menses should receive attention; and, if suppressed, they should be restored by the use of the warm hip-bath, aloes, the chalybeates, or other measures that may be deemed appropriate.

Want of sleep, which is one of the most distressing accompaniments of insanity, and contributes greatly to aggravate and sustain it, should never be neglected. When apparently connected with active cerebral congestion or inflammation, it must be left to the remedies calculated to obviate these conditions. But, under other circumstances, it should be corrected by special remedies. Sometimes it will yield to blisters applied upon the extremities or epigastrium. Mr. S. Newington, of England, recommends the extensive application of mustard, by means of cloths saturated with the infusion, wrapped around the lower extremities and the lower parts of the body simultaneously, as extraordinarily efficient in producing sleep; and a bath, or deep hip-bath, into which five or six handfuls of mustard have been thrown, may be used for the same purpose. (*Lancet*, June, 1865, p. 621.) Fatiguing employment during the day will, in some instances, obviate the habitual nocturnal restlessness. Occasionally the nervous stimulants, as assafetida, Hoffmann's anodyne, camphor, valerian, garlic, &c., may be used very advantageously. But nothing upon the whole is so effectual as opium; and this remedy should be employed, in some one of its forms, whenever the affection seems indisposed to yield to other means, and no decided contraindication exists in the congested or inflamed state of the brain. If found upon trial to be useful, it may be persevered in; if otherwise, it can be omitted; and no serious evil need be apprehended, with a moderate degree of caution. It will often most happily control the maniacal paroxysms. It must be given more freely than in the healthy state of the brain, in order to produce its legitimate effects. The requisite quantity must be ascertained by trial; but generally from one to three grains will be found sufficient for a dose, unless given so frequently that the system becomes habituated to it. Ipecacuanha or tartar emetic may often be added with advantage. When opium disagrees with the patient, other narcotics will sometimes answer, such as hyoscyamus and conium; but they must be given in large doses to have effect. Chloroform might be tried in such cases, either by the stomach or in the way of inhalation, with reasonable hope of benefit;

but its occasional fatal effects, when administered in the latter method, should preclude this use of it, unless under extraordinary circumstances. Bromide of potassium is said also to act very efficiently as a soporific; ten or fifteen grains being given at bedtime, and repeated twice, if necessary, at intervals of half an hour.

In other forms of systemic irritation, with frequent pulse, muscular tremors, relaxation of the surface, and more or less general disturbance of the functions, opium is often an admirable remedy, controlling these irregularities most happily, when depletion would aggravate the mischief, and might produce great danger. This condition is not unfrequently met with in puerperal mania; but occurs also in other cases attended with general debility. The opium may here sometimes be advantageously combined with camphor, the ethereal preparations, assafetida, &c.; and occasionally the debility is so great as to call for alcoholic stimulants and quinia.

The maniacal paroxysm has been very speedily relieved by ethereal inhalations; but care must be taken that, at the time of their employment, there is no active congestion or inflammation of the brain or its membranes. Perhaps chloroform might be safer in this respect, as rather sedative than stimulant in its action on the nervous centres. Benefit may be expected from the use of this remedy internally, in connection with camphor. Digitalis in large doses, and hydrocyanic acid have also been recommended.

Puerperal mania is to be treated upon the same general principles as the ordinary forms of the disease; but almost all writers agree in considering it as requiring more caution in the use of depletion, and as seldom bearing the loss of blood from the arm. Opium and the various nervous stimulants, with due attention to the state of the digestive and menstrual functions, and, in cases of violent cerebral symptoms, local depletion, with cold applications and subsequent blisters to the scalp, are the chief physical remedies required. Excessive frequency of pulse may be controlled by the cautious use of digitalis, aconite, or veratrum viride; or, if the skin is also hot and dry, by one of the antimonials or ipecacuanha. Sir J. Y. Simpson speaks strongly of the efficiency of a nutritious diet in this form of insanity.

In excitement of the venereal propensity, some good may occasionally result from antaphrodisiac remedies, of which dulcamara, very freely employed, is perhaps among the most efficient. Lupulin and bromide of potassium may be employed with the same view. Gout or rheumatism, with which the insanity may have alternated, should be invited to its original seat by hot water, rubefacients, or blisters. If the disease has followed the disappearance of an eruption, attempts should be made, by pustulation with tartar emetic, croton oil, or other irritant, to reproduce the cutaneous affection. Hemorrhoidal disease, which may have disappeared, should be restored by means of the hot hip-bath and aloes.

Machines have been invented, the rotary motion of which, by giving a centrifugal direction of blood from the head towards the extremities, or producing that sort of nausea and attendant prostration which accompany sea-sickness, has been supposed useful in the treatment of insanity. The effect, however, of these machines is necessarily temporary; and the danger is that, upon the cessation of the movement, there may be a reactive tendency of the blood to the brain, which shall more than counterbalance the previous benefit. It is possible that they may sometimes be usefully employed in controlling the violence of the paroxysm. The employment of a tourniquet to the extremities, in such a way as to admit the blood through the arteries and prevent its return through the veins, may be tried with the same object of temporary depletion from the brain; but caution must be used not to allow the instrument to remain too long.

recommended by Dr. Kenneth McLeod, who has found it useful, not only in promoting quietness, but even in restoring reason. He gives from two to six minims of the officinal acid, which may be repeated in fifteen or thirty minutes if required. (*Med. T. & Gaz.*, March, 1863, p. 262.)

In the moral treatment of insanity, a proper regulation of ordinary personal intercourse is of great importance. The deportment towards the patient should be as much as possible the same as towards persons in health. He should not discover, from the manner of those around him, that he is looked upon as insane. Instead of the tone or look of harshness or command, he should be addressed with gentleness and courtesy; nothing should be said to wound the self-love or self-esteem which he feels as strongly as other men; and whenever firmness and the exertion of authority become necessary, everything like an appearance of anger or violence should be banished from the voice and manner. The attendants should exhibit, in their deportment, a model for the insane to copy, not an imitation of the violence of insanity, which the patient will be first to appreciate.

The same rule should be extended to the whole treatment of the patient. There should be as much as possible of liberty, consistent with the safety of the patient and others; as little as possible of forcible restraint. Nothing that can be avoided should remind him of his difference from other men. His apartment, though well secured, should not look like a prison cell. In all his movements he should be carefully watched and guarded, when not well enough to be trusted to himself; but this should be done in a manner not to excite his suspicions. The attendance upon him should appear in the form of friendly care, companionship, or service, as the case may be, not of the watch of a jailer over his prisoner. Nothing more excites anger, and maintains a turbulent spirit in the insane, than violent restraint. Independently of its positive discomfort, they feel it an unprovoked and unwarrantable injury. How is it possible for a brain to recover its regular and calm movements, when thus tortured by fierce excitement? Happily, the days of chains, dungeons, the scourge, and starvation are passing away. But it is mournful to reflect upon the numbers formerly goaded into incurable madness, or sunk into hopeless mental impotence, who, under judicious management, might have been restored to comfort and usefulness.

In conversation with the patient, the subject of his insanity should be most carefully avoided. Unthinking persons sometimes amuse themselves with the peculiarities of the insane, and lead them purposely to the special subject of their illusion. This is cruelty. The sufferer might well exclaim: "It is amusement to you, but death to us." It is like irritating a wound that others are attempting to heal. It is in general altogether useless to argue with the insane, and to endeavour to convince them of their error. No impression is produced upon their convictions, and their tempers are unnecessarily irritated. The aim of their physician and care-takers should be to turn their thoughts away from the subject of their false impressions, to surround them with circumstances which should offer as little occasion as possible for the excitement of their perverted feelings. Regular occupation, physical and mental, should be provided. Nothing is more effectual in soliciting the mind back into a healthy mode of action. Ideas are presented in due order, and steadily presented, so that the mind is accustomed to trains of connected thought. The broken threads of association before hanging loose in the mental machinery, are thus fastened together; and the tendency to fly from one isolated thought to another is gradually corrected. Innocent amusement, too, and various recreation, should be provided, in order to arouse healthful feeling, and, in monomaniacal cases, to direct emotion towards other points than that morbid one in which it has a constant tendency to centre.

In all these respects, public institutions have great advantages. They can provide occupation in gardening, farming, and the different mechanic arts; their patients may have the opportunity of taking long walks and drives, and of making diversified excursions of recreation, business, or instruction, under proper guardianship; they can arrange systematic courses of instruction by schools, lectures, and reading suitably regulated; in fine, they afford the means of various social amusements, such as balls, concerts, plays, and games of an innocent or useful tendency. Meetings for social conversation and worship, in which the most orderly afford an example which the imitative tendency of the disorderly often induces them to copy, may be of much service. By all these modes the mental functions of the brain are duly medicated; calmed down when exalted, elevated when depressed, and rectified when crooked and perverse. Reason clearly points out such a course as indicated by the circumstances of the case; and experience has abundantly confirmed its correctness, by the great success which has resulted everywhere from its adoption.

The necessity is obvious of studying the peculiarities of each particular case, and applying proper measures to its special wants. The course that may be advisable for one kind, or stage, or degree of insanity, may not be proper, may even be injurious, in another. In public institutions, it is often possible to classify the inmates according to their resemblance in these respects, and thus to bring particular plans to bear on numbers. The social principle which leads man to seek his fellow, and by a sort of elective affinity causes every individual in a crowd to fall into his proper place, is here sometimes highly useful in subduing the morbid propensities which, if indulged, might render exclusion from the circle necessary. Though some analogy in the condition of the patient should serve as the principle of association; yet those should not be brought together who may happen to labour under similar delusions; for their thoughts and conversation would inevitably cluster around these delusions, and the tendency would be to increase and confirm them.

Allusion has already been made to the necessity of separation from former friends and accustomed scenes. In general, it is best, while the patient remains in the institution where he may be placed, that all former associations should be broken off; that the visits of friends should not be permitted; and that all the circumstances around him should be new. Relaxation of this rule may occasionally be found advantageous; but of its general applicability to the cases of the insane there can be no doubt.

Among remedial mental influences, the fine arts, and especially music, hold an important place. Independently of the very suitable occupation they afford, they often exert a soothing influence over mental irritation, operating sometimes with all the charm-like efficiency of the nervous stimulants in hysterical affections. I have seen the utmost paroxysmal violence of mania gradually calmed down by the sweetness of the female voice in singing, and terminate in a peaceful sleep under its influence. The power of David's harp over the insanity of Saul is familiar to every one.

In hypochondriacal cases, good may sometimes be derived from appearing to accord fully with the patient, and so managing that the state or action upon which the delusion turned should seem to come to a natural termination. Thus, the experiment has often been tried, and sometimes successfully, with those who imagine a living animal to exist within them, of making a slight incision in the skin, and adroitly slipping into a vessel a real animal, which they were made to believe was extracted through the wound. Attempts, however, of this kind are said occasionally to end unfortunately. Thus, I have seen somewhere the account of a hypochondriac, who confined himself to his chamber because convinced that he was too bulky to pass through the door, and who, having been forcibly pushed through, in order to destroy his illu-

sion, fell dead under the powerful shock upon his ima
of a strong counter-feeling may sometimes be adva
believing himself dead, might perhaps be roused in
hear a conversation, which should ascribe to the de
practices invented for the occasion. But these cont
any permanent effect.

Though harsh proceedings of all kinds towards the
it is necessary sometimes to employ restraint, in or
injuring themselves or others. The camisole, or str
rary confinement to the bed or a chair by leather st
to injure the skin, may be occasionally resorted to; a
the hands may become necessary to prevent the ex
practices, or a disposition to break and tear everyth
of. Some prefer, to such close personal restraint, the
lent patient up in a room, of which the walls and f
soft, elastic material, calculated to prevent injury to
contact with them. Something in the shape of pena
order may also, in some instances, have a favourable
patient to control his propensities; but punishment
or disgraceful. Temporary seclusion, or the denial o
pected gratification, is allowable; but chains, the du
shock of a shower-bath, never. In the violence of t
bath may be employed, sometimes very effectually, a
measure; but not as a punishment after the violence

The patient should always be encouraged to keep
son, and neat in his dress; and, if inattentive himse
have the office performed for him by others. The fr
essential. It will be impossible to restore a due degre
sane, while immersed in filth, and clothed in rags.

An important rule, in the application of these m
consider a case as hopeless, but to treat every one, h
low, as if there were some chance of improvement.
cian are sometimes rewarded by recoveries in cases
perate; and with almost all, if they cannot be cured,
be effected, or at least the circle of enjoyment enlar

Travelling, with proper attendance, has sometime
on the insane, by the constant succession of noveltie
it offers, and the withdrawal of attention from the su
bid feeling. The late Dr. Joseph Parrish used to rel
who, upon the occasion of descending a mountain in
and novel landscape before him, suddenly exclaimed
mind threw off the cloud which had oppressed it, as
smiling and beautiful scene.

Article VI.

DELIRIUM TREMENS.

Syn.—*Mania à Potu.*—*Mania à Temulentia.*—*Delirium tre*

THIS is the delirious affection which follows the su
use of alcoholic drinks or other stimulants. Its ess
in the cerebral debility consequent upon the cessati
citement. The most prominent symptoms are delirious
of impending evil, muscular tremors, and the want

lirium tremens originated with Dr. Sutton, by whose tracts, published in 1813, the attention of practitioners is said to have been first generally directed to the disease. It was, however, familiar to the physicians of this country long before that period. In a paper published in 1820, Dr. Chapman speaks of the stimulating plan of treating *mania à potu* as having been the established practice of this city for upwards of half a century. (*Phil. Journ. of Med. and Phys. Sci.*, i. 195.)

Symptoms, Course, &c.—The disease exists in various degrees, and with different complications, which give it a considerable diversity of appearance. It may be simple; it may be mingled more or less with the direct effects of alcohol upon the brain; or it may be connected with various accidental diseases. I shall consider it under each of these aspects.

§ 1. *Simple delirium tremens.*—The first effects of the suspension of the stimulus are feelings of great weakness or sinking of the whole system, with an indescribable anxiety and agitation, which are strongly expressed in the countenance and manner of the patient. He is troubled with frightful imaginations, vague alarms, and depression of spirits; his sleep is disturbed; his hand trembles; his mind is weak and confused, though without positive delusion; the pulse is soft, feeble, and often frequent; the extremities are cool; the whole surface is disposed to perspiration; and disorder of the digestive apparatus is shown by the frequently furred tongue, defective appetite, and tendency to constipation. This is the condition familiar to old drunkards under the name of *the horrors*. It is often experienced in a slight degree by intemperate persons in the morning, before the first dram. It almost always yields to the reapplication of the accustomed stimulus.

Should circumstances, however, prolong the abstinence or privation, this preliminary condition becomes aggravated, and the disease is fully formed. The perceptive faculties are now disordered; and the patient receives false impressions through his senses, which he at first often recognizes as imaginary, and may even be disposed to smile at, but which soon acquire in his convictions all the force of reality. Not unfrequently it happens, for a time, that the phantasms seem real at night or in darkness, and either vanish, or are known for what they are by daylight. The patient sees the most grotesque, frightful, and disgusting objects; little hobgoblins of all possible shapes flying about the apartment, leering, hissing, threatening; serpents, toads, rats, mice, and other loathsome reptiles and vermin, crawling over his bed or person, or running about his room; creeping insects, which he appears busied in searching for among his clothes or the bed covering. There is no end to the number or diversity of these hallucinations in different individuals.

But with all this variety in the objects of delusion, there is one striking feature of the delirium which is seldom wanting. The patient is almost always fearful, and often has some special object of terror, which influences most of his movements. One person is pursued by justice; another flies from a creditor or an avenging enemy; another is attacked by robbers or assassins. Voices are heard conspiring the destruction of the patient; he sees a gun pointed at him through the windows, or a knife glittering in an imaginary hand within his curtains. He hides from pursuit; defends himself against assault; struggles violently against persons aiming to seize or bind him; perhaps jumps out of a high window in order to escape; screams for aid, or implores pitifully to be spared; occasionally even seizes on a pistol or a sword, and commits manslaughter in supposed self-defence. In some instances, it is for others that he fears. Some violence is going on within his sight or hearing, and often of a revolting character, as of a child strangled by its parents, of a body beheaded or quartered, of a person falling a victim to assassins, &c. Most of the violence committed by the subjects of this disease, their occasional vociferations, their struggles, their attempts at flight, and even their assaults on others, originate in some notion of personal danger or disgrace to be avoided. There is seldom, if ever, any disposition to injure, any malignant feeling, as of revenge, or hatred, to gratify.

Very often the manner of the patient is quiet and gentle. He recognizes persons about him, receives his physician courteously, answers his questions without hesitation, and, if his attention is roused and strongly fixed, will give rational answers upon all points except such as are connected with his hallucinations. The countenance, however, has usually a peculiar expression of absence, vacancy, or pre-occupation; and a close examination will often detect evidences of fear in the manner, even when nothing is said by the patient on the subject. He will sometimes turn his head on one side, with a quick, alarmed look, as if dreading some danger from a particular direction; or will have a listening ear, as if endeavouring to catch distant sounds of fearful import. He usually submits without hesitation to those who have the care of him, and readily takes the medicines that are offered.

Morbid vigilance is one of the most characteristic symptoms. The disease begins with broken and disturbed rest, becomes confirmed with the occurrence of obstinate wakefulness, and ends when the patient is enabled to sleep profoundly. It frequently happens that not a wink of sleep is obtained for several days, and it is said sometimes not for one or even two weeks.

Muscular tremors are also a very common, though not essential attendant on the complaint. The physician, in feeling the pulse, is struck with the trembling of the tendons, and, if not previously aware of the nature of the disease, has his suspicions awakened by this symptom. Though most perceptible in the hands, the tremors will be generally found to affect the whole system. They are observable in the tongue when protruded; and the speech is not unfrequently affected by them. They sometimes amount to convulsions.

The pupil is often contracted, but there is no intolerance of light or sound. The pulse is sometimes quite natural, except, perhaps, that it may be softer and weaker than in health; but it is often frequent and feeble, and occasionally very frequent. The tongue is usually somewhat furred, though moist; the appetite is wanting; the bowels are generally constipated; and the stools, when procured, may be dark and offensive. The breath is often fetid. The skin is generally moist; and profuse perspirations, attended with an unpleasant smell, are apt to break out in consequence of great muscular exertion. The patient is, in most instances, able to be upon his feet, and dislikes confinement to the bed. There is sometimes great debility; the pulse being very feeble and frequent; the skin cold and clammy, the features pale or purplish; and death occasionally ensues from this cause, especially if the patient uses much exertion. I once saw a person, affected with delirium tremens, jump from a public stage-coach, walk about a quarter of a mile, return to the coach, and die immediately from exhaustion.

At the end of three or four days, though sometimes as late as a week or later, if no untoward event happens, the patient generally falls into a sound sleep, which may continue for twelve, eighteen, twenty-four, and it is said even thirty-six hours. From this he awakes, feeble, pale, and trembling, but free from his illusions, and generally disposed to eat. Convalescence has now commenced, and, though some delirious symptoms may occasionally linger or recur for a day or two, they gradually disappear entirely, and the patient is restored to health. Not unfrequently, the first sleep is only for a few hours, and is followed by an amelioration of the symptoms, which subsequently disappear upon a return of rest.

Instead, however, of this favourable course, cases improperly treated, or without treatment, sometimes lapse into what may be called the third stage, which is characterized by great prostration. The delirium is now complete; the previous illusions give way to incoherence; extreme restlessness takes place, so that it is often necessary to confine the patient forcibly to his bed; the tremors are excessive; the pulse is extremely frequent and feeble; cold or warm sweats cover the surface; the features are sunken and haggard; the tongue is brown and dry; the pupils are much contracted or dilated; and subsultus tendinum, muttering delirium, coma, and convulsions precede death.

The successive stages of the disease do not always occur with regularity. Not unfrequently the complaint is arrested, as already stated, without reaching the second or third stage. In some instances, the first stage is wanting, and the patient passes at once into the fully formed disease; and cases occur in which typhoid symptoms are present at the commencement.

The whole duration of the complaint varies generally from three or four days to a week; but sometimes the delirium continues for ten days or two weeks.

2. *Complication with the immediate effects of the stimulant.*—After a protracted debauch, in which the inebriate has surrendered himself, with a sort of insane fury, to his propensity for days or weeks in succession, it sometimes happens that the brain, or stomach, or both, are stimulated into inflammation, or a degree of vascular irritation bordering upon it; and a state of system is produced, in which either the drinks become disgusting, or can no longer be tolerated; or in which they are withheld by friends from a conviction of the absolute necessity of this course. The symptoms of morbid cerebral excitement, proceeding from the direct agency of the alcohol, now become mingled with those resulting from the want of the stimulus, or those characteristic of delirium tremens. The face is flushed and turgid, the lips intensely red, the head hot, the tongue furred or of a fiery redness, the appetite quite gone, the thirst extreme, and the pulse excited, full, and tense. The violent delirium of meningitis is mingled more or less with the hallucinations, the tremblings, and the wakefulness of delirium tremens; convulsions are not unfrequent; and, if not relieved, the symptoms are exchanged for those of stupor, coma, and fatal prostration. In some instances, a state of almost apoplectic stupor attends the case from the commencement; and the symptoms of delirium tremens are developed only upon the subsidence of the congestion. In others, excessive vomiting appears to keep the cerebral symptoms for a time at bay.

3. *Complications with accidental affections.*—When the intemperate are overtaken by a serious injury, or attacked by a disease which takes away the appetite or opportunity for strong drink, the symptoms of delirium tremens very frequently become mingled with those of the accidental affection, and materially complicate the case. Severe surgical injuries, such as fractures, dislocations, and wounds, often owe their fatal termination in drunkards to the supervention of delirium. All the phlegmasiæ are liable to the same occurrence; and some of them are the more dangerous on this account, as the cerebral phenomena are apt to mask the symptoms of the original affection. This is especially the case in pleurisy and pneumonia. Genuine meningitis sometimes occurs in drunkards; and the two cerebral affections mingle, and modify each other, so as sometimes greatly to confuse the diagnosis. The severer idiopathic fevers seem to escape this complication; for, though there is often great prostration in these diseases occurring in drunkards, the peculiar symptoms of the trembling delirium are not apt to occur.

Anatomical Characters.—The opportunity is not often presented of examining an uncomplicated case of delirium tremens after death; but, when such examination has been made, nothing has been discovered which could account for the symptoms. Sometimes an abnormal amount of serum has been found in the ventricles, in the cavity of the arachnoid, and infiltrating the cerebral substance; but this may have been a mere result of the habitual state of the brain in drunkards, in whom there is often a strong tendency to serous effusion, as evinced by their bloated faces. It certainly does not account for the symptoms of the disease. In some instances, marks of congestion and inflammation have been noticed; but this only proves, what the symptoms indicate, that the drunkard is sometimes attacked with meningitis or cerebritis in consequence of the direct influence of the poison, or from other causes. As most patients, who die in delirium tremens, do so from other diseases upon which the delirium supervenes, it necessarily follows that the signs of these diseases will be discovered in their bodies after death. Hence, besides cerebral inflammation, dissection occasionally reveals marks of acute gastritis, pneumonia, pleurisy, &c. All the lesions, moreover, indicative of those numerous chronic affections resulting from intemperate habits, are liable to be met with; such as cirrhosis, fatty degeneration and chronic inflammation of the liver, Bright's disease of the kidneys, chronic gastritis and enteritis, &c.; but these have no essential connection with the complaint under consideration, which, so far as dissection throws any light upon the subject, must be regarded as strictly functional.

Causes.—The essential cause of this species of delirium is the suspension of a stimulus to which the brain has been accustomed. In order that it may be produced, there must have been a certain continuance of the previous stimulation, so as to have formed a cerebral habit. The brain must have accommodated itself to the habitual excitement, which has thus become a part of its ordinary condition, and essential to its ordinary acts. Hence, steady tipplers, who always keep themselves under the influence of alcohol, without ever becoming absolutely intoxicated, are more liable to the disease, upon any interruption of this habit, than the occasional drunkard, who commits a debauch now and then, but allows intervals in which the brain may emerge from under the effects of the poison, and reacquire its healthy state.

The disease is not confined to the use of any particular variety of alcoholic drink, though, for obvious reasons, most apt to result from the strongest. Hence its great prevalence in the United States, where the cheapness of spirituous liquors has generally placed at the command of every one an amount of stimulation, which would exceed the means of the majority of the population in the wine-drinking and beer-drinking communities of Europe. Happily, a moral influence sprang up some years since to counteract this facility of the means of intoxication; and the consequence was, that the cases of delirium tremens were much diminished. This result was obvious to those who had the superintendence of our hospitals and alms-houses; but I fear that a reaction is taking place; and already the effects are experienced in an increase of the disease.

Persons of sedentary habits are much more easily affected than those who labour; because, under vigorous exercise, the stimulus is expended in the various functional operations of the system, instead of concentrating its whole force upon the brain.

As already stated, the occurrence of an accidental injury, or of a violent disease, is apt to be the exciting cause of the delirium, by interrupting the use of the stimulant, causing its rejection by the stomach, or rendering the system for a time insusceptible to its influence.

Nature seems to have provided that the condition of nausea and vomiting, which are not unfrequently induced by the abuse of alcoholic drinks, should avert the delirium, and sometimes afford the organs an opportunity of returning to their healthy state, without the intervention of this disorder. The condition of the brain under the influence of nausea, which is as much a cerebral action as any other sensation, is in a great measure incompatible with the peculiar disturbance of its functions, such as occurs in delirium tremens. It is very common to see drunkards, labouring under an attack of cholera morbus, or other disease attended with nausea and vomiting, who, while in this condition, retain the full possession of their mental faculties, but, if the stomachic affection is interrupted, pass at once into the state of delirium.

It is said that the abuse of other cerebral stimulants, and especially of opium, is liable to lead to the same affection, by a similar interruption of their employment. Though, from my connection with the Pennsylvania Hospital, I had for many years frequent opportunities of witnessing cases of delirium tremens, I never met with one which I could trace to the use of that drug. The affection, therefore, from this cause, I presume to be very rare; and, even in cases which may be supposed to have such an origin, it is not always easy to determine whether the patient may not have indulged also in alcoholic drinks. Dr. B. H. Coates, however, in an excellent treatise upon delirium tremens, published in the *North American Medical and Surgical Journal* for 1827 (vol. iv. p. 34), states that he has seen well characterized cases, in which the disease resulted from the intermission of the use of opium.

The late Dr. Chapman informed me that he had seen the disease, with all its essential features, result from the excessive use of tobacco; but, as this is sedative in its influence on the brain instead of stimulant, the delirium was the consequence of its direct operation, not a secondary result as in the case of alcohol, and ceased when the narcotic was omitted.

The delirium which sometimes comes on in the temperate, after a severe injury or surgical operation, excessive mental exertion, or a long loss of rest, with fatigue and anxiety, has been considered by some as identical with that from the abuse of alcohol; but others deny the identity; and certainly there is sufficient difference in the symptoms and course of the affections to authorize at least very strong doubts upon the subject. The excitement produced by alcohol is peculiar; so, also, I think, is the depression which follows the withdrawing of the stimulus.

Nature.—Little remains to be said upon this subject. The reader will before this have observed that I consider delirium tremens as a disorder of the cerebral functions, immediately dependent upon the diminution of the degree of excitation necessary for the support of the brain in its ordinary actions. The brain is in a state at once of debility and depression. It may be objected to this view, that there is increased muscular effort amounting sometimes to violence; that, instead of reposing as in sleep, the brain is in perpetual action; in fine, that the phenomena are in general those of disturbance rather than depression of the animal functions. But we must recollect that the brain is not like other organs, and that its actions must be judged of by a different rule. One of its singularities, as already explained, is that totally opposite conditions of the organ are attended with apparently similar effects. (See *pages* 764–5.)

Reduce the amount of healthy excitant influence, and we have disturbances in the various functions quite equal to those which would result from an excess of it. There is little doubt that, could we look into the interior operations of the brain, in delirium tremens, we should see the springs of the organ everywhere relaxed, its machinery moving languidly and feebly, and the streams of its influence sent forth scantily to their several destinations. The vacuum thus created in all parts of the system gives rise to disturbances, not unlike those arising from repletion of the same influence; just as the wind and the storm, in the exterior world, follow as well the diminution of the sun's influence as its increase. But, though the phenomena are somewhat similar to those of over-excitement, there is yet a difference which is appreciable by close observation. The heart beats more rapidly, but it beats feebly; the muscles may be thrown into occasional violent action, but they tremble; the mind may be agitated, but it is with terror, and not with daring. A correct view of this subject is of practical importance; for the treatment depends upon it. If we believe the brain to be in a state of high vascular irritation or inflammation, we shall be disposed to deplete; if in the contrary state, we may deem it advisable to stimulate.*

Diagnosis.—The affections with which delirium tremens may possibly be confounded are febrile delirium, meningitis, and the different forms of insanity. In the well-marked cases of these several affections the diagnosis is very easy; but instances now and then occur in which a decision is difficult, and, for a time, even impossible.

The delirium of fever is more incoherent than that from drink, does not usually generate the same fantastic hallucinations, is without its fears and its tremors, and is attended with greater apparent muscular prostration, with a wholly different expression of countenance, and with much more heat and dryness of skin. The last stage of delirium tremens bears considerable resemblance to a certain stage of typhoid fever; and, if the case were seen only in this condition, there might be some doubt as to its nature; but the previous history, if attainable, will almost always determine the question.

Acute meningitis has greater violence of delirium, more febrile disturbance, and a stronger tendency to convulsions and coma, while it is without the coherence, the imaginary terrors, and the muscular tremblings of the alcoholic disease; but not unfrequently the two affections are conjoined; and the cases of delirium tremens following immediately a prolonged debauch, and presenting symptoms of cerebral congestion or inflammation, have somewhat of this complicated character.

Insanity is usually much more gradual in its approach, less apt to see phantoms, or to be haunted with terrors, less frequently attended with muscular tremors, and much more persistent. Mania is more incoherent, monomania more rational. The paralytic tremblings of dementia may bear some resemblance to the tremors of delirium tremens; but the whole course of the disease is different. A case of the latter complaint, complicated with palsy, might sometimes be mistaken for the former; but the error must soon be corrected. Dementia is not so sleepless as delirium tremens. The case of greatest difficulty is one in which real insanity has occurred in a drunkard, and become complicated with the symptoms of the disease under consideration. Such, probably, are those cases in which, after the subsidence of the peculiar symptoms of delirium tremens, the patient continues insane.

In forming a diagnosis, the physician will always be much aided by a knowledge of the previous habits of the patient. Sometimes, however, a habit of intemperate drinking is concealed with great art, and the occurrence of an attack of delirium is the first event which excites suspicion.

Prognosis.—Simple, uncomplicated delirium tremens is not a dangerous disease. It generally subsides spontaneously, and, under proper treatment, almost always ends favourably. The chief danger is of death from debility, and especially from exhaustion after muscular exertion; and, if this be guarded against, there is little else to apprehend. Sometimes, also, the patient destroys himself; but very rarely with suicidal intention.

But, when the disease is complicated with cerebral inflammation, or a high degree of active cerebral congestion, when it supervenes upon a severe injury, or occurs in the course of another serious disease, it adds no little to the daner; and such cases not unfrequently end in death. Stupor, convulsions, omplete incoherence, muttering, subsultus, extreme frequency of pulse, a dry ongue, and a cold clammy surface are unfavourable signs.

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* The state of the urine, as examined by Dr. H. Bence Jones, affords additional evidence in favour of the view, that the action of the brain is depressed in delirium tremens. In acute inflammation of the brain, he has uniformly found an increased amount of the phosphates, which he ascribes to an active oxidation of the cerebral matter, consequent on an excessive action of the organ. In delirium tremens, on the contrary, there is a diminution of the phosphates, while the proportion of the sulphates and urea is greatly increased, indicating, as Dr. Jones supposes, excessive activity, and of course oxidation of the muscles. (*Lond. Med. Gaz.*, July, 1851, p. 81.)

Very few die of the earlier attacks. Each successive one becomes more angerous, because usually occurring in a more debilitated constitution, and ssociated with a greater amount of organic disease. Yet some individuals ecover from very numerous attacks, and die at last either of some accidental isease, or of the complicated organic derangements resulting from intempernce, independently of the delirium.

Of 1241 cases of delirium tremens, in all its forms and stages, and of inemperance expected to end in delirium, admitted into the Philadelphia Hosital (Blockley) from May, 1834, to November, 1839, and subjected to a vaiety of treatment, 121 cases proved fatal, or somewhat less than one in ten. Gerhard, *Tweedie's Syst. of Pract. Med.*, Am. ed.)

Treatment.—According to the view here taken of the pathology of delirium remens, the indications of treatment are, clearly, *first*, to stimulate the brain p to the point essential to its correct action, and *secondly*, after having thus einstated it in its normal functions, to withdraw gradually the artificial support, nd bring the organ safely back to a reliance upon the ordinary healthy influnces. In almost all uncomplicated cases, these objects can be accomplished ithout difficulty, provided the treatment has not been postponed so long, that he system has sunk beneath the lowest point of impressibility.

The first question to be decided is in relation to the character of the stimuation to be employed. It appears obvious that, as the suspension of alcoholic rinks was the cause of the disease, the cure is to be effected by their restoation; and experience has shown that there is no easier or more certain ethod than this, of removing the delirious symptoms, and restoring the paient to his previous state of health. But here a high moral consideration ntervenes. It seems as though nature had kindly provided this affection, as means of checking the drunkard in his downward career, and offering him n opportunity of retrieving his lost position. In the great majority of intances, if left to itself, the affection subsides, and the patient, though feeble, in a condition of sanity, capable of reflecting on the past, and of securing imself by the exertion of a very possible self-control for the future. Is the hysician to step in, and obviate this kind provision of nature by reapplying e original poison, and thus placing the patient in a situation, certainly not ore favourable, it might, I think, with propriety be said, even more unfaourable, than before the occurrence of delirium? It appears to me that, by timulating with alcohol, we incur the risk of confirming the patient in his vil habit, and of hastening the last fatal result, which must come in one shape r another, if this habit be persevered in. The plan of alcoholic stimulation s safer in hospitals than in private practice; because, in the former, the paient may often be detained, after his restoration to sanity, until the evil habit as been in some measure eradicated by a gradual withdrawing of the stimulus. ut, even in this situation, the patient cannot be detained against his will in his country; and very frequently he demands his liberty, in order to satisfy is craving, long before the cure is accomplished. In private practice, the lan is, I think, ruinous. No sooner is sanity restored, than the patient again ecomes his own master, or rather the slave of his morbid inclination; and as lost all the benefit which abstinence would have afforded him.

It is, therefore, highly desirable to find some other stimulus, which may be fficient to support the nervous system during the continuance of the disease, ay occupy in some measure the cravings of the patient upon his first returng consciousness, and may be more readily withdrawn when it ceases to be ssential. Happily such a stimulus we have in opium. It affords a gentle support to the brain, quiets nervous disturbance, favours the return of sleep, and, when no longer required, can be given in gradually diminished doses, if necessary without the knowledge of the patient, who feels himself, almost unconsciously, placed upon his feet, prepared to commence again the journey of life, it may be, with better purposes, and more power of will to carry them into effect. Much has been said of the directly injurious influence of opium on the brain, of its producing convulsions, and favouring congestion and inflammation. With a proper selection of cases, and a proper use of the medicine, these dangers need not be apprehended. It is certainly possible to give the patient with delirium tremens enough opium to destroy him, as it is possible to produce the same effect with any other poison. But there is not the least occasion for incurring any such danger. The object is not to force sleep at all events. It is not to pour in the narcotic in such quantities as completely to overwhelm the brain, and, if sound sleep cannot be induced, at least to bring about a state of coma. It is sufficient for the object to keep the patient moderately under the influence of the narcotic, so as to prevent his nervous powers from failing, and patiently to wait till the disease ceases in its ordinary course, and sound sleep returns.

Sometimes, however, the debility is so great, that the moderate use of opium alone is not sufficient to counteract it. There is danger of fatal prostration unless the patient receive further support. In such cases, alcoholic liquids should be allowed in quantities sufficient to sustain the vital functions. The least stimulating, the most tonic and nutritious of these should be preferred. The malt liquors usually answer the purpose admirably well. In extreme debility brandy must be resorted to, if necessary to save life. But no more should be given than is requisite to sustain sufficient strength; and, when no longer essential to this purpose, it should be withdrawn.

Upon these principles the treatment of delirium tremens was long conducted in the Pennsylvania Hospital when I was connected with that institution, and with very satisfactory success. It rarely happened that a case of the simple disease proved fatal, unless introduced in the last stage of exhaustion.

The particular plan of treatment which I have usually pursued is the following. Two grains of opium, half a grain of sulphate of morphia, or an equivalent quantity of one of the liquid preparations of the drug, are given every two hours, and steadily persevered in, until sleep takes place, or a decided narcotic impression is evinced. This quantity is seldom exceeded. When, after one or two doses, the patient is found very susceptible to the influence of the narcotic, the interval should be lengthened to three or four hours or more, or the quantity diminished. Upon his awaking from the first sleep, should the least tendency to hallucination remain or return, the medicine is to be given in quantities sufficient to control the tendency, and to be gradually diminished or omitted as the occasion for its use lessens or ceases.

Should the pulse be feeble, and the skin cool, the patient may be allowed from one to two bottles of ale or porter, or an equivalent quantity of wine, in twenty-four hours; and, should the debility be alarming, recourse may be had to brandy, or other form of ardent spirit. But it must be remembered that the alcoholic stimulus is employed simply to support a due degree of strength, and to obviate the danger of fatal prostration. Tincture of hops or of lupulin, in the dose of half a fluidounce every three or four hours, sometimes answers a very good purpose; affording the requisite support to the system, while it co-operates with the opium in producing sleep.

To obviate the tremors when excessive, and in cases which exhibit a tendency to convulsions, the nervous stimulants should be added to the other remedies. Assafetida and compound spirit of sulphuric ether are those upon which I place most reliance. In slight cases, infusion or oil of valerian may be employed.

In cases of violent excitement, advantage may be expected from the internal use of chloroform, which may be given in the dose of from forty to sixty drops, repeated at intervals of an hour or two, until its quieting or depressing effects are experienced. The most convenient mode of exhibition is that of emulsion with a little camphor, the yolk of an egg, and water. Care must be taken not to carry the remedy so far as to produce prostration. The cold shower-bath has been tried, with very happy results, in these cases of great cerebral excitement, by Dr. Robert Law, of Dublin. It not only calms the patient, but is often followed by sound sleep, and subsequent recovery. (*Dub. Quart. Journ.*, Feb. 1858, p. 34.)

Should the patient, as sometimes happens, be seized with sudden and alarming prostration, sulphuric ether may be given in the dose of from two to four fluidrachms, repeated at short intervals, in connection with powerful alcoholic stimulants.

The condition of the organic functions should be attended to. If the bowels are constipated, cathartics should be administered, adapted to the circumstances of the case; calomel or mercurial pill being added to the other medicines, when the hepatic secretion is deficient. Magnesia, castor oil, rhubarb, and aloes are generally preferable to the more active depletory purgatives. Senna may be employed when something more energetic is requisite. Irritability of the stomach, if it exist, may be quieted by lime-water and milk, the effervescing draught, small draughts of carbonic acid water, aromatic spirit of ammonia, and a sinapism or blister to the epigastrium; and, should opiates be rejected from the stomach, they may be administered in twice the quantity by the rectum. Advantage has accrued from the subcutaneous injection of one of the salts of morphia, dissolved in a little distilled water. Not more than from half a grain to a grain of the salt should be used at once in this way.

Should the patient fall into the typhous condition, which very rarely happens in the uncomplicated cases, his strength must be supported by carbonate of ammonia, brandy toddy, milk-punch, egg beat up with brandy, essence of beef, &c., as in proper typhus fever.

In very obstinate cases of sleeplessness, which resist the usual measures, and persist for a week or more, a blister over the whole scalp sometimes has a most happy effect. The same remedy should be resorted to when convulsions occur, or a tendency to coma supervenes. When the disease has long resisted opium, sleep has repeatedly been induced by ethereal inhalation; and chloroform has been employed for the same purpose, but requires much caution, for fear that its depressing influence may prove dangerous in the debilitated state of the patient. Dr. W. R. Richardson, assistant physician in the hospital at Blackwell Island, N. Y., states that, in two cases under his notice, it had produced fatal effects almost immediately, and, in many instances, a similar result had been prevented only by assiduous care. (*Am. Journ. of Med. Sci.*, Oct. 1856, p. 368.) Another case, in which death immediately followed the inhalation of but a moderate quantity of this anæsthetic, is recorded by Dr. Dorlie in the *Medical Times & Gazette* (June, 1861, p. 33). Perhaps by combining ether and chloroform, as practised by Dr. Joseph Parrish, of Burlington, New Jersey, in a case recorded in the *New Jersey Medical Reporter* (i. 301), the great energy of the latter may be obtained, while its prostrating effects may be counteracted by the stimulant agency of the ether.

Dr. James Grieve, of Dumfries, Scotland, has employed with advantage the extract of belladonna, as a local application, when the pupil was contracted, in order to expand it, and thus obviate the spectral illusions, which probably tend to prevent sleep. (*Ed. Month. Journ. of Med. Sci.*, Nov. 1853, p. 430.)

Great caution should be observed not to interrupt the sleep of the patient, unless it appear to assume the form of coma, or unless the occurrence of a cold clammy skin, with sinking of the pulse, should indicate the necessity for stimulant and nutritive substances. Upon awaking, the patient should be furnished with some gently stimulating and nutritious substance, to obviate exhaustion; and perhaps nothing is better for the purpose than the yolk of egg beat up with ginger and hot water, to which a little wine or brandy may be added if deemed requisite.

Some modification of the above treatment is necessary in those cases of protracted debauch, in which symptoms of active congestion or inflammation of the brain, the direct result of the excessive stimulation, are mingled with the peculiar symptoms of commencing delirium tremens. Here it sometimes becomes necessary, in order to prevent disorganization of the brain, to take blood either generally or locally or both, to make cold applications to the head, and to administer an active purge. Should the symptoms of congestion disappear, and a pure case of the ordinary delirium be developed, the plan already detailed should then be carried into effect. But, if stupor or convulsions continue, the whole scalp should be blistered with little delay; and the accruing debility counteracted by just as much stimulation as may be necessary to prevent the patient from sinking; the arterial and nervous stimulants, as carbonate of ammonia, capsicum, musk, assafetida, &c., being preferred to the alcoholic, until found to be insufficient to fulfil the indication. Oil of turpentine or assafetida may also be given by enema.

In the complicated cases, the treatment must be modified according to the character of the complication. Should it be a surgical accident, the plan recommended for the simple cases should be carried out, and opium may be even more freely employed, unless the head be the part affected, and meningeal and cerebral inflammation be apprehended. If the associated disease be one of debility, the necessity for alcoholic stimulants will be greater than under ordinary circumstances; and quinia will sometimes be found a most valuable auxiliary. But, beyond all comparison, the most frequent complications are the phlegmasiæ; and these offer to the physician one of his most perplexing therapeutical problems. The principles of treatment, however, appear to me to be pretty well determined. To prevent disorganization, the quality of the blood must be altered, and this can be effected in no way so satisfactorily as by bleeding. But the patient, already debilitated by his habits, will sink under this treatment, if his ordinary artificial support be withdrawn. It is, therefore, necessary to administer alcoholic drinks in such amount as may be requisite to sustain the functions, and control the delirium. When the relief of the inflammation can be accomplished by leeching or cupping, these should be preferred to the lancet; but there should be no hesitation in resorting to the latter, when the symptoms are very threatening, and the pulse tolerably strong. Blisters, too, should be freely employed in these cases. One of the most frequent of these local affections is gastritis; and leeches to the epigastrium may often be usefully applied, even when it is necessary to administer stimulants internally. Inflammation of the brain offers the most difficult question; as the force of the necessary stimulus bears in this instance especially upon the over-excited organ. The rule of treatment, however, has been already stated; namely, to deplete as far as the strength will permit, to blister, and to use only that amount of stimulus absolutely necessary to support life, preferring such substances as have least tendency to operate especially on the brain. It not unfrequently happens that the delirium of drunkards conceals some serious local inflammation, which may be sapping the foundations of life, while the physician is directing his measures only against the obvious symptoms. In every case, therefore, of delirium tremens, it is highly important that the several organs should be thoroughly investigated, to ascertain whether there may not be some phlegmasial complication. Should febrile symptoms attend the complaint, the presumption will be altogether in favour of the existence of such an affection.

The question will early present itself, what course is to be pursued in relation to the confinement of the patient. Is he to be forcibly kept in his bed? to be shut up, as some have recommended, in a dark cell? or to have a certain amount of liberty of movement? I prefer the last-mentioned course. Forcible confinement often leads to excessive and exhausting struggles; while solitude and darkness exaggerate the terrors of the patient, and fix his hallucinations more firmly. The proper plan, I think, is to allow as much liberty of movement as may be compatible with the safety of the patient, and the convenience of his attendants, the most careful watch being kept over his actions, and all tendency to violence soothed or restrained. But when very weak he should be confined to his bed; as fatal syncope may result from a continuance in the erect position, especially if muscular exertion be used at the same time. In this prostrate condition, he should never be left without constant oversight. I have known death to result from a patient rising from his bed at night, during the absence of his attendants.

The diet should be adapted to the circumstances of the case. In the earlier stages, when there is any local inflammation, it may be sufficient to give farinaceous substances; but ordinarily the patient may use milk and the lighter kinds of animal food; and great debility must be counteracted by broths, animal essences, egg and wine, milk-punch, &c.

The above is the course of treatment which coincides best with my own judgment and experience in this complaint; and it probably accords more or less closely with the views of the majority of practitioners. Other plans, however, have been proposed.

Of these the most successful, so far as regards immediate results, is probably the purely stimulant plan as advocated by Dr. Gerhard. Under this plan, the proportion of deaths from delirium tremens in the Philadelphia Hospital (Blockley) was reduced from one in eight, which it had been originally, to one in about thirty-three. Dr. Gerhard gives from one to two fluidounces of brandy every two, three, or four hours, according to the previous habits and the degree of debility, always employing the least quantity that will tranquilize the patient, and gradually diminishing as the occasion for the stimulus ceases. The largest quantity necessary at first, in each case, is seldom required longer than twenty-four hours. (Tweedie's *Syst. of Pract. Med.*, Am. ed., article *Delirium Tremens.*) I have already given my reasons for not thinking this plan generally the most expedient.

Another mode of treatment is the emetic plan, originally proposed by the late Dr. Joseph Klapp, of Philadelphia. He was induced to adopt this treatment, from observing that the disease was apt to occur upon the cessation of an attack of vomiting in the intemperate, and that the spontaneous supervention of vomiting, during the disease, relieved the delirium. The fact that an attack of cholera morbus in an intemperate person, if arrested, is apt to be followed by delirium tremens, I can verify by repeated observation. The state of nausea appears to be, in some measure, incompatible with the cerebral condition peculiar to this disease. Dr. Klapp gave two grains of tartar emetic every fifteen minutes till it operated, and found it necessary to give from eight to sixteen grains before the effect was obtained. Much more than the largest quantity mentioned was sometimes necessary; as the stomach or rather brain is remarkably insusceptible of the emetic impression. The symptoms were immediately ameliorated after vomiting, and the patient rapidly recovered. (*Eclectic Repertory*, vii. 251, A. D. 1817.) This plan has proved successful also in other hands; but it has sometimes failed, and sometimes been attended with fatal results. Indeed, when it is considered that, in simple delirium tremens, debility is almost the only danger, it seems to be a necessary inference, that a remedy which must add to the debility, however quickly effectual in many cases, cannot but prove injurious in others, if indiscriminately employed. Besides, the stomach is often inflamed in drunkards, and it would seem that the large amount of tartar emetic sometimes necessary, cannot but seriously aggravate the gastric disease. The practice has not been generally adopted; but cases sometimes occur, in which it might be preferable to the opiate plan, when the debility is not great, and the stomach in no degree inflamed.

Dr. Alexander Peddie, of Edinburgh, has treated upwards of eighty cases with uniform success, chiefly by means of tartarized antimony, given, not as an emetic, but in moderate doses as a sedative. He gives from one-quarter to one-half a grain, every two hours, and conjoins with the antimonial preparation purgatives when necessary, freedom of bodily movement, nourishing food, and abundance of light. (*Ed. Month. Journ. of Med. Sci.*, June, 1854, p. 506.) Mr. Paget has, in the more sthenic cases, advantageously combined antimony with opiates, in imitation of the practice of Dr. Graves, of Dublin, in the cerebral affections of typhus. (*Med. Times and Gaz.*, Jan. 1858, p. 63.)

Large doses of digitalis have recently been employed, to a considerable extent, in the treatment of delirium tremens, and with the most extraordinary results. In the *Medical Times and Gazette* for September, 1860, is a paper by G. W. Jones, Esq., of the Island of Jersey, in which the author recommends this remedy on the grounds of a large experience. One of his patients labouring under this disease took a fluidounce of tincture of digitalis in mistake for another medicine. Instead of the fatal results which he anticipated, Mr. Jones was astonished to find that the symptoms had disappeared, without any untoward effects whatever. Influenced by his experience in this instance, he afterwards uniformly employed the medicine in all the cases which came under his notice, amounting to at least 70, and in all with favourable results, except a single one, in which a tumour in the brain was found after death. His plan of treatment was to give half a fluidounce of the tincture in a little water, and this was generally sufficient for the cure. In some cases, it was deemed expedient to repeat the dose at the end of four hours, and still more rarely to give a third dose in six hours; and this quantity was the largest administered by him in any instance. Under its use the nervous disorder abated, the pulse became slower, fuller, and stronger, and the skin warmer; and after a time the patient fell asleep, not from the direct effect of the narcotic, but from the removal of the morbid state of the brain which had caused wakefulness. The urine was not increased, and no untoward symptoms occurred in any case. Since the appearance of Mr. Jones's paper, the journals have teemed with accounts of the use of this remedy, almost all confirmatory of the results originally announced. In some instances the medicine has produced vomiting, and in others has failed of the desired effect; but the general current of testimony is so decidedly in its favour, that however much opposed to previous views of the action of digitalis, we cannot resist the conclusion of its extraordinary efficiency and general safety. Instead, however, of the half-ounce doses given by Mr. Jones, some have, I think more prudently, given only two fluidrachms for the first dose, to be repeated every two, three, or four hours in half the quantity, till the desired effect was obtained. In the use, however, of so powerful a remedy, and in doses so heroic, it is of great importance to be absolutely sure of the nature of the disease, and then to watch the case carefully, so as to be ready to obviate poisonous symptoms should they appear.

Still another mode of treatment is that mentioned by Dr. Chapman as having been the practice of Dr. Kuhn, formerly one of the most respectable physicians of Philadelphia. It consisted simply in "confining the patient in a dark cell, and leaving the disease spontaneously to work itself off." Dr. Kuhn was known to declare that, after an extensive trial in the Pennsylvania Hospital, he had found no measure to answer as well as this. (*Philad. Journ. of Med. and Phys. Sci.*, iii. 242.) This plan has been followed by other practitioners, and something very similar to it is recommended by M. Calmeil, who does not, however, insist on darkness. There can be no doubt that great numbers will recover under this plan; and it is certainly better than the depletory; yet it will not prevent death from prostration, which is the greatest danger of the simple cases. In the paper of Dr. Coates, before referred to, Dr. Kuhn is stated, on the authority of Dr. Currie, to have employed the opiate practice so early as the year 1783. (*North. Am. Med. and Surg. Journ.*, iv. 235.)*

Perhaps the most dangerous method of treatment is that of bleeding, with other modes of depletion, founded on the notion of the inflammatory nature of the complaint. Though these remedies may be necessary in certain complicated cases, they are altogether contraindicated in the unmixed disease; and the experience of the profession is certainly not opposed to what seems to be the clear deduction of common sense.

Prophylactic Treatment.—This should consist in a gradual abandonment of the habit of drinking alcoholic liquors. Individuals who are unable by their own unaided will to break this habit, often voluntarily place themselves in public institutions, in order to supply their deficiency of resolution by a species of exterior compulsion. I have frequently treated such cases in the Pennsylvania Hospital, and have never found any difficulty in safely withdrawing the accustomed stimulus, and dismissing the individual released, at least for a time, from his disgraceful thraldom. The plan is simply to give daily the least quantity of alcoholic liquor, generally ale or porter, that is necessary to ward off an attack of delirium tremens. This quantity diminishes each succeeding day, and, in a period varying from one to three or four weeks, the stimulus can be altogether dispensed with. Advantage will sometimes accrue from counteracting nervous symptoms by opium. But the patient should not be dismissed until he has been entirely without both of these stimulants for a week or more.

Article VII.

EPILEPSY.

Syn.—*Falling sickness.*

Epilepsy (from *ἐπιληψια*, attack or seizure) is characterized by paroxysmal attacks of convulsions, with loss of sensibility and consciousness, without fever, and followed usually by coma. This definition is probably as correct as can be given, though not quite satisfactory, as it may include cases not strictly epileptic, certain hysterical convulsions, for example, and excludes others usually attached to epilepsy, and having the same essential nature, such as vertiginous paroxysms, to which attention will be called directly. But entire precision in a definition, which is founded on symptoms alone, can scarcely be expected; for it almost always happens, especially in nervous affections, that phenomena apparently similar may result from very different pathological conditions.

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* Prof. Thos. Laycock, of the University of Edinburgh, has published an account of many cases of delirium tremens in which he employed the expectant plan with entire success. Out of 24 cases treated in this way not one ended fatally. His method was to keep the patient at rest, preferably in bed when the object could be accomplished without force, to avoid all causes of excitement as far as possible, to give suitable food from time to time without alcoholic stimulants, unless specially indicated, to favour diaphoresis should a tendency to it appear, to keep the surface and especially the feet warm, and to secure for the patient the attendance of an experienced nurse, to watch and guard him from injurious influences. If the head were hot, he prescribed a gentle douche of cold water, repeated every 3 or 4 hours. At night he generally gave the patient a bowl of soup, with two or three tablespoonfuls of wine to render it acceptable to the stomach. (*Edin. Med. Journ.*, Oct. 1858, p. 289.)—*Note to the sixth edition.*

Symptoms, Course, &c.—I shall consider, *first*, the paroxysms; *then*, their relations towards each other, with the condition of the system in the interval; and *lastly*, the general course and termination of the disease.

1. There are often premonitory symptoms, sufficient to warn the patient of the approach of the paroxysm. Very different statements are made by authors as to the relative frequency of their occurrence. The result of the statistical researches of M. Beau (*Archives Générales*, tom. ii.) is, that the paroxysms are preceded by symptoms of this kind in about one-half of the cases; and this is probably near the truth. The precursory phenomena differ greatly in duration and character. They may continue but for an instant, may last several minutes, or may extend to hours or days. They are generally brief, not longer than may afford opportunity to the patient to seek a favourable position, and often not long enough for that purpose. The following are among the symptoms alluded to; though it must be recollected that often not more than one or two of them are manifested in the same case. Sometimes the premonition consists only in a general alteration of the state of feeling; the patient being either, on the one hand, unusually depressed, gloomy, morose, or irritable, or, on the other, unusually elevated and cheerful. There may be a failure of memory, or confusion of thought, or a state of apparent revery, in which the look is fixed and vacant. Headache, drowsiness, vertigo, flushing or paleness of the face, and a feeling of fulness or emptiness of the head are not unfrequently experienced. Among the most common symptoms are disordered sensations or perceptions, such as dimness of sight or temporary blindness; double, partial, or luminous vision; optical illusions; noise in the ears; the perception of unreal odours and flavours; general uneasiness; and feelings of pain, tingling, or formication in the limbs, and other parts of the body. Strabismus, an altered state of the pupil, oscillatory movements of the iris, sneezing, sighing, hiccough, and various singular movements, as running, leaping, dancing, whirling round, &c., are also mentioned among the preliminaries. Sometimes the premonition consists in a deficiency or excess of appetite, or the coming on of nausea and vomiting. All writers on epilepsy treat of a singular and characteristic phenomenon, called *aura epileptica*, which consists in certain strange sensations, as of a stream of cold water or of cold air, or feelings of heat, pain, itching, or tingling, commencing at some point of the body distant from the brain, in a finger or toe, for example, or in the leg, arm, uterus, testicle, top of the head, lips, breast, &c., and proceeding towards the brain. When the sensation reaches the head, or the epigastrium, if this lie in its route, there is an immediate loss of consciousness, and the patient remembers no more. This phenomenon, however, is comparatively rare. In the great majority of cases, nothing occurs to which the name of *aura epileptica* can be attached.*

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* Dr. Brown-Séquard, whose authority on the subject of epilepsy is very high, believes that the *aura*, or something equivalent to it, is much more frequent than is generally supposed. In his opinion, there are many cases in which an influence similar to that of the aura proceeds from some external point in special relation with the nervous centre, exciting the epileptic paroxysm, even though not sensible to the patient: as, for example, the irritation of worms in the bowels may bring on an attack, without any perception of such irritation. In reference to the treatment, he considers the discovery of such concealed sources of irritation of great importance; as, by breaking the connection between them and the nervous centre, there may be good hope of preventing the paroxysms, and relieving, if not ultimately curing, the disease. The existence of such spots may be known by the production of a fit by pressure, or by means of strong galvanic excitation, or by cold, or by the application of a sponge wet with hot water; and these measures may

Either after a longer or shorter duration of one or more of the above-mentioned symptoms, or suddenly, without any premonition whatever, the patient falls as if struck down by a blow, frequently uttering a shrill peculiar cry, which is sometimes startling and almost fearful. At the moment of falling, he is seized with general convulsions, which are often so powerful as to require the strength of several persons to restrain them. The spasms usually alternate rapidly with relaxation; but some of the muscles, especially those of the trunk, are apt to be affected with rigid or tonic contractions; and, though the limbs are thrown about with great violence, the body does not in general move far from the spot in which it fell. One side is frequently more affected than the other. The head is twisted round; the features are drawn to one side as by jerks, and frightfully distorted; the eyes are turned up so as to show only the whites, or roll from one side to the other, or are fixed with a rigid stare; the eyelids are closed or half-open, or widely and spasmodically distended; the jaws often grind together by an oblique motion, and the tongue, which is thrust out of the mouth, is sometimes badly wounded; the arms and legs are thrown about with violence, striking against neighbouring objects, and not unfrequently both receiving and inflicting injury; and, while the muscles of the arm generally suffer alternate contraction and relaxation, the thumb is often rigidly flexed; and the same is said to be sometimes the case with the toes. The pupil may be either contracted or dilated, or neither; but is usually insensible to light, and immovable. All the senses are for the moment paralyzed. Impressions which in health are most powerful, the brightest light, the loudest sounds, the most pungent odours, the severest wounds, are quite unfelt. The face is usually swollen, flushed, and of a purplish or livid hue; and the veins of the neck also are swollen; though, in some instances, the opposite condition of shrunk and pallid features is observable, especially at the commencement of the attack. Respiration appears to be difficult and imperfect. The rigidity or irregular contraction of the muscles prevents the due expansion of the chest; the air does not fully enter the lungs, and seems to be stopped in some measure at the glottis, which is probably sometimes spasmodically constricted; and hence in part the dark suffusion of the countenance. The struggle in the throat causes the air to be intimately mixed with the mucus, which appears in the shape of foam at the mouth. The pulse is generally small, frequent, and irregular; while the heart palpitates rapidly and often tumultuously. In some instances, involuntary evacuations from the rectum and bladder, and priapism with seminal emissions take place. After an uncertain but generally brief duration, the convulsive movements subside, the rigid spasm relaxes, the face becomes pallid and shrunk, a profuse perspiration often breaks out, and, though the insensibility still continues, the body is quiet, and nothing remains of the previous disturbance, except perhaps some noise in respiration. At length consciousness gradually returns, though at first accompanied with some confusion of thought; and the patient, sitting up or rising upon his feet, looks about him with a stunned, astonished, vacant, or stupefied air, highly characteristic of the affection. This may soon pass off, and the patient return to his ordinary state; but very frequently the fit is followed by various unpleasant symptoms, which will be detailed immediately.

The duration of the paroxysm varies from a few moments to many hours.

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be employed in searching for them in various parts of the body. If it be found that a ligature around one of the limbs has the effect of preventing an attack of convulsions, there is good reason to believe that the source of the concealed aura is in that limb, and thus the limits of the research may be narrowed. If any particular muscle or muscles are observed to be affected with rigid spasm or cramp immediately anterior to or at the commencement of the paroxysm, the probability is that the aura proceeds from this source; and the point would be determined if by pressure on the muscle, or by galvanic excitement, an attack of convulsions should be induced. (*Note to the sixth edition.*)

The average is probably somewhere between five and twenty minutes. When it continues several hours, or, as sometimes happens, for a day or more, there is scarcely ever a steady perseverance of the convulsions; but these alternate with periods of quiet coma; as if the whole consisted of distinct paroxysms, succeeding each other so rapidly that the second stage of one has not fully ended, before the first stage of the following one begins. More than fifty paroxysms may thus occur, in the course of one or two days.

The symptoms which immediately follow the paroxysm are various. Sometimes, as before stated, after a short period of mental confusion, the patient returns to his ordinary condition. Very frequently he falls asleep, and after a time awakes in the possession of his faculties, and feeling well, except that he often has a sense of fatigue or exhaustion, and is sometimes bruised or wounded in consequence of his fall, or of the violent movements of the paroxysm. In other instances, he is affected with headache, vertigo, mental confusion, and occasionally with nausea and vomiting. Sometimes he vomits blood, and passes black and altered blood by stool, probably in consequence of the congestion arising from the partially suspended respiration. Instead of mere drowsiness, from which the patient can be roused, there is sometimes stupor or coma, lasting for hours or days. Temporary insanity, in some cases, follows the paroxysm, varying, in different instances, from the slightest mental alienation to the most violent mania. In this latter form, the affection is sometimes designated as the *epileptic fury*. These symptoms generally subside in the course of two or three days. It may be mentioned here that, instead of following the convulsions, the mental affection occasionally precedes them; and instances have been noted in which the disease began with an attack of maniacal delirium. Sometimes, upon emerging from the paroxysm, the patient is found to be slightly paralytic; and instances of chorea have occurred under the same circumstances. There is an utter unconsciousness of all that passes during the paroxysm. The interval between the first shock of the disease and the period of awaking is a complete blank; and the patient only knows that he has had a fit by his soiled clothes, his bruises, his feelings of fatigue, or other derangements of which frequent experience has taught him the significance.

Death sometimes takes place in the paroxysm, in consequence either of apoplectic congestion or effusion, or of apnœa resulting from suspended respiration. But this event is rare.

The affection, as above described, is epilepsy in its full development. Not unfrequently the paroxysms are much milder; and instances every now and then occur, in which, instead of convulsions and coma, the attack is merely *vertiginous*, being attended with giddiness, mental confusion, and inability to stand, but without a complete loss of consciousness. I have known the fit to consist of this condition, attended with something like paralytic sensations, and loss of power of particular limbs. In cases somewhat more severe, the patient becomes suddenly unconscious, has a fixed, open, meaningless eye, and slight, partial convulsions, as of a hand, an arm, one of the muscles of the face, &c. If standing at the time of attack, he may fall; but if sitting or lying, the condition may pass over almost without notice; and the patient himself, upon recovering, sometimes resumes his discourse where he had left off, as if nothing whatever had happened. These spells are usually very brief, sometimes lasting less than a minute. They are known to be epileptic, because it is not unfrequently in this way that the disease commences, because these slighter paroxysms occasionally alternate with the severe in the same case, and because, in different cases, there is every grade between the mildest and the most violent. It is no uncommon event for these *vertiginous spells* to continue for several years, gradually increasing in intensity, and at length ending in the fully-formed convulsive and comatose paroxysms.

Epileptic attacks may occur at any period of the twenty-four hours. Not unfrequently they take place at night, during sleep, and in some persons only at night. It is said that they are sometimes confined to this period at the commencement of the disease, and again near its close, when it is about to terminate favourably. This would seem to indicate that there is something promotive of epileptic convulsions in the condition of being in bed at night. Is it in the position which favours the afflux of blood to the brain? This is not probable; for it is not till after sleep has begun that the effect is experienced. The cause is probably connected with the sleeping state, which certainly has a tendency to favour spasmodic muscular movements. Every one is familiar with the sudden start which is so apt to arouse us from the first sleep. In febrile diseases, too, and in complaints of debility, attended with nervous disorder, the muscular twitchings and subsultus are much more marked in the sleeping than the waking state. The most plausible explanation appears to me to be, that, in the repose of the functions of animal life, the organic nervous centres acquire increased excitability, and are thrown into irregular and violent action by a degree of irritant influence, which they do not feel when the animal functions are in full exercise.

2. The *interval* between the paroxysms is not less variable than their degree of intensity. Sometimes, after the first attack, another does not follow for months or years, even for several years. In such cases, the succeeding paroxysms are apt to occur at gradually diminishing intervals. In other instances, the paroxysms are very frequent and numerous in the beginning, and afterwards become less so, settling down at last into a more or less regular recurrence at longer or shorter intervals. The period of recurrence may be a year, six months, three months, a month, a week, a day. Several paroxysms may take place upon one day, or within two or more succeeding days; and afterwards they may not recur for weeks or months. Some patients have one fit upon each recurrence; others have two or more. In general, though there may be a tendency to a particular interval, yet the recurrence of the fit is liable to great uncertainty. Often there is a total want of regularity, and not the least calculation can be made as to the period of attack. In some few instances, a regular periodicity is observed. This is most apt to occur in females, and has some connection with their menstrual function. Occasionally it appears to be connected with the causes of intermittent fever, in which case the disease has been regarded as a concealed intermittent. But I have no doubt that regular periodical attacks of epileptic convulsions occur, without any such obvious cause, in the same way precisely as we have intermittent headache and intermittent neuralgia.

Though epileptic patients may have excellent health in the intervals of their attacks, and their organic functions may go on with apparently perfect order, yet there is usually something in them different from the condition of other persons, some peculiarity which evinces that the cerebral functions are more or less deranged. They are often, for example, headstrong, obstinate, capricious; determined for the time being in what they will, but changing their will continually; with memories frequently feeble or defective, and an inability to fix the mind continuously upon any course of laborious thought or investigation. Perhaps this character is in part ascribable to the injudicious indulgence with which such patients are apt to be treated from their youth up.

3. The *course* of epilepsy is generally one of deterioration. The paroxysms are apt to return with greater frequency, and to assume a higher grade of intensity, if originally very mild. But this is not all. The brain appears to be gradually more and more deranged in its functions, in the intervals of attack. The memory and intellectual powers in general become enfeebled. Sometimes positive mania ensues, ending at last in dementia. Sometimes the

mental disorder has the character of debility from the commencement of the process of deterioration. In rare instances, an increased intellectual impairment may be seen after each paroxysm; much more frequently it is very gradual, and the effect is rendered striking only by comparing distant points of time. The altered cerebral condition exhibits itself also in various effects upon the exterior. There is a striking change in the features. They become enlarged, coarse, less intellectual, and more sensual, not to say brutish in character. Beauty suffers greatly, in relation both to form and expression. The gait is slouching, often somewhat one-sided, partly perhaps from deficient power in some of the limbs, but quite as much from the loss of that consciousness of inherent strength and dignity, which tends to give erectness to the person, and firmness and precision to the movements. At last the patient sinks into complete imbecility. Not unfrequently he is very troublesome from the unequal deterioration of his intellect and animal propensities; the latter being often violent, because no longer restrained by the former. Along with the progress of imbecility, disorder in the motor functions becomes evident, in strabismus, rigid contraction of certain muscles, distortion of the features, a one-sided position of the head, &c. With these changes, the organic functions often continue little if at all impaired. Digestion and nutrition are vigorous, the generative faculty remains, and the female menstruates regularly, and may become pregnant.

This course may be accomplished in a few months or years; but much more frequently occupies a great number of years; and epileptic patients may grow up from infancy to middle age, and even to a somewhat advanced age. The progress towards imbecility is said to be more rapid in cases commencing before than after puberty. Its rapidity also bears some proportion to the frequency of the paroxysms. It is probably increased by habits of life and other causes which lower the general tone of the system, such as masturbation, excessive venery, and the abuse of alcohol and opium.

Though the general course of epilepsy is thus towards imbecility, it is not always so; and individuals occasionally reach a good old age without any material impairment of their mental faculties.

Anatomical Characters.—Anatomy has revealed nothing that can throw light upon the pathology of epilepsy, except to show that it is not connected essentially with any peculiar organic derangement of the brain. This organ has often been found to all appearance healthy, in epileptic persons who have died of other diseases. It has also been found affected with every possible variety of lesion, which has in some instances probably stood in the relation of cause, sometimes of effect to the epileptic paroxysms, and has sometimes had no other than an accidental connection with them. Lesions have been detected also in other vital organs, especially the lungs, heart, and alimentary canal. This is only what might have been anticipated. Epileptic patients are liable to the same diseases as other individuals, and generally die of some other affection than that under which they have been long labouring. Of course, the traces of these diseases are discovered after death; but they afford no clue to the origin or nature of the convulsive affection.

When death has resulted from a recent paroxysm, the brain and its meninges appear greatly congested; the white substance being of a reddish colour, and the cineritious substance deep-red, purple, or violaceous. But no lesion is exhibited, implying the existence of disease anterior to the congestive movement, which is probably simultaneous with the paroxysm.

In old cases, in which death has been preceded by dementia, and perhaps something like paralytic symptoms, the marks of chronic inflammation have been observed; as partial induration or softening of the gray and white substance of the brain, and of the cerebellum, general injection and dilatation of the vessels, a dull white appearance of the medullary substance, and a marbled or rose colour of the cortical, diseases of the pineal and pituitary glands, adhesions of the membranes to the surface of the brain, thickening of the membranes, and various effusion into the arachnoid cavity, or into the ventricles. These are probably rather results than causes of the epileptic disease.

Other lesions, however, have been occasionally noticed, to which the epilepsy might be referred, as thickening of the cranium, projections of its internal table consequent upon external violence, caries of the inner table, exostoses pressing on the brain, thickening of the membranes, abscesses, hemorrhages, and different kinds of tumours, especially carcinoma and tubercles.

Causes.—The causes which predispose to epilepsy are not well understood; though that a predisposition to it exists, in many of those attacked, is quite obvious. *Inheritance* is usually considered among these causes; and there is probably some truth in the general opinion. The *time of life* has certainly some influence over the tendency to the disease. It is more common in early than in advanced life. It very seldom originates in old age. More individuals are attacked before the period of puberty than after it. The nervous system is naturally very excitable in infancy, and easily thrown into disorder by disturbing causes. Many cases occur about the age of puberty; and the changes which the system undergoes at that period are thought by some to predispose to the disease. Whether *sex* has any influence in forming a predisposition to epilepsy is uncertain. From the statistics which have been given to the world, it might be inferred that females are somewhat more frequently affected with epilepsy than males. I am quite certain that, within my own circle of observation, there have been more male patients than female. *Celibacy* has by some been supposed to predispose to epilepsy, because a very large proportion of those affected with it are unmarried. But this is more reasonably ascribable to the fact, that the occurrence of epilepsy very often serves as a bar against marriage; and thus patients are unmarried because they are epileptic, not epileptic because unmarried.

The exciting causes are very numerous. Judging from my own observation, I should say that a considerable proportion of the cases occurring in early life have their origin in an attack of cerebro-meningitis. Injury of the brain from external violence not unfrequently induces the disease. This cause sometimes apparently operates by a direct lesion of the brain or the consequent inflammation, sometimes by the depression of a portion of the skull or of its inner table. Other tangible causes of the disease are congenital malformation of the head, and various organic affections of the cranium or encephalon, such as were mentioned among the anatomical characters.

Whatever strongly disturbs the cerebral functions may prove an exciting cause of epilepsy; and some of these causes appear by their continued operation to create a predisposition, which either an excess of the same cause, or some other one of a disturbing character, may bring into action. Exposure to the direct heat of the sun, and excitation from violent bodily exertion have sometimes brought on an attack. Among the most fruitful sources of the disease is undoubtedly excess of the stronger passions. Terror is thought by some to have induced it more frequently than any other cause. The origin of the disease can often be traced directly to fright; and the same cause often induces paroxysms in individuals subject to the complaint. It has been observed that congenital cases are apt to have been preceded by some occasion of great terror to the mother during pregnancy. The forcing of early intellectual culture is probably a not unfrequent cause of the disease in delicate children. It is said that a strong excitement of the imitative principle has sometimes resulted in epilepsy; children, and especially girls, having, in many instances, been attacked by the complaint from merely witnessing the convulsive paroxysms in others. Some have even supposed that persons who have often feigned to have epileptic fits, have sometimes ended by becoming really subject to them. Masturbation and excessive venery are accused of very often inducing epilepsy. The abuse of alcoholic drinks and of opium is another fruitful exciting cause.

The sexual functions appear to have some influence; at least the disease, as already stated, is apt to appear at the age of puberty, and in women has been observed to occur frequently during the menstrual period. There has been reason also occasionally to ascribe it to the irritation of pregnancy.

Other diseases are frequent causes of this. Attacks of it sometimes follow the retrocession of gout and rheumatism, the disappearance of a cutaneous eruption, the healing of old ulcers, and the suppression of some habitual discharge, whether morbid or physiological. It is sometimes associated with, and probably dependent upon disease of the kidneys. Various febrile diseases, especially small-pox, give origin to convulsive attacks which take on the form of epilepsy; and, as before stated, the regular periodical form of the disease has by some been considered as a masked intermittent fever.

There is little doubt that the disease occasionally has its origin in syphilis; as cases have repeatedly been observed in connection with the secondary or tertiary symptoms of that complaint, and have yielded to treatment addressed to it. Whenever, therefore, a patient known to be suffering under constitutional syphilis is attacked with epilepsy, there is reason to suppose that the disease may have originated in this source; and, should nodes, or any other evidence of syphilitic affection be noticed about the head, the presumption would be greatly strengthened.

Irritation from disease, situated in various parts of the body, is among the most frequent provocatives of epilepsy. How could it be otherwise, when every part of the body has a centre of communication in the brain, to which it imparts all impressions made upon itself, and which must, therefore, participate in all its disturbances? Irritation of the stomach is a notorious exciting cause of epilepsy. Hence it is, probably, that corrosive poisons, such as arsenic, have occasionally induced the disease. Numerous instances have been recorded in which it was supposed to originate from worms in the bowels. Various functional and organic diseases of the heart, lungs, liver, and urinary organs have been accused as causes of epilepsy. The same is the case with the uterus, and amenorrhœa is supposed to be a fruitful source of it. The occurrence of pregnancy is said to suspend, if not to remove this variety of the disease. Tumours along the course of nerves, or hard bodies, as spicula of bone, wounding them, are said to have occasioned epilepsy. There is every reason to think that spinal irritation may sometimes excite it. The affection has received special names from its supposed origin in these extra-cerebral affections; as *epilepsia gastrica, enterica, verminosa, hepatica, hysterica,* &c.; but this is a useless complication of nomenclature.

A morbid state of the blood, resulting from imperfect excretion, in consequence of disorder in the various emunctories, as in Bright's disease for example, may possibly act either as a direct or exciting cause of epilepsy; and some have been disposed to consider the affection as altogether humoral; but this exclusive view is certainly unsupported by facts, and has not, I think, even plausibility in its favour. Dr. A. J. Payne has called attention, in the *Indian Annals* (No. xiv. p. 597), to a form of convulsive disease closely resembling epilepsy, which he ascribes to miasmatic influence, and supposes to consist essentially in an altered state of the blood. It may or may not be associated with febrile paroxysms. It yields to *quinia.*

Nature.—The disease probably consists in a morbid excitability of the brain, and each paroxysm in a morbid excitement or irritation. A prominent effect of irritation, when beyond a certain point, is first to derange, and, if still further increased, to abolish function. This law is applicable as well to the brain as to other organs. The irritation which occasions the paroxysms is sufficient to suspend all the cerebral functions connected with the mind; sensation, perception, consciousness, intellectual action, emotion, volition; but, in relation to the motor function, is sufficient only to derange, not to abolish it. In this respect epilepsy differs from apoplexy. In the latter affection, not only are all the mental functions suspended, but, to a great extent, that of motion also. The difference may be owing to a less degree of the irritant or disturbing force in epilepsy, or to its more especial direction to the cortical substance, whereby the mental functions, which are probably connected with the latter, may suffer most, while the motor function, connected essentially with the medullary substance, being as it were in the outskirts of the irritant influence, feels only enough of it to be excited into a morbid increase of action, and not enough to be overwhelmed entirely. It has been supposed that the involuntary muscular movements of the epileptic paroxysm must depend on irritation in the spinal centres, while the mental phenomena have their origin in the brain. But there does not appear to me to be any ground for this belief. It is true that the spinal centres are capable of producing involuntary muscular contractions; but they are not exclusively so. Every voluntary muscle has a centre in the brain, and nervous cords of connection, through which the will operates upon it. It is easy to conceive that the influence of the will may be suspended by a morbid or irritant action, which shall equally have the power of sending down motor influence from the brain; and this is, I think, undoubtedly the case in epilepsy. All the symptoms point to the brain as essentially the seat of the disease; and, when the originating point of irritation is in the spinal marrow, it is only like any other external source of irritation, as in the stomach, bowels, or uterus; it produces its effects secondarily through cerebral intervention.

Now it is clear, if the above views are correct, that organic derangement of the brain is not essential to epilepsy. The cerebral anatomy may be perfectly healthy; and yet the functions greatly deranged through irritation alone. But organic diseases in the brain would be apt to excite the affection, if not carried so far as to destroy function altogether. Epilepsy may, therefore, originate in and be sustained by inflammation of the brain, or by any other organic alteration, as tumours, osseous spicula or exostosis, depressed bone, thickened membranes, effusion, &c., which shall produce a certain amount of irritation in the cortical substance, sufficient to suspend function, and a somewhat less amount in the white substance, sufficient only to excite and derange function. If the cause operated on the former substance alone, we should have coma or delirium; if on the latter alone, we should have spasm or paralysis, as in cerebritis. It is clear, too, that an irritation sent to the brain from any point of the body whatever, which shall be equally forcible as that originating in the brain, and have the same special directions, will produce the same effect. The epilepsy, strictly speaking, is the same in both cases. It is only the cause of it which differs. The true pathological condition is only a morbid excitability of the brain, which enables ordinary causes to produce the proper epileptic derangement of its functions, or a morbid excitement from some powerful cause capable of producing the derangement without predisposition.

There does not, therefore, appear to be any strict basis for the division of epilepsy into *idiopathic* and *symptomatic*, or, according to the nomenclature of Dr. Hall, into *centric* and *eccentric*. It is the same affection, whether dependent upon a tumour within the encephalon, worms in the bowels, or a mere morbid excitability of the brain, through which it is thrown into derangement from ordinary causes. Nor is there sufficient ground for this distinction in relation to prognosis or therapeutics. It is true that the prognosis is more favourable, when the disease can be shown to have its origin in an external source; and it is also true that, in such a case, we know where to direct our remedies. But the fact is, that we can seldom be certain, perhaps never, that the disease does depend upon an external cause, until it ceases upon the removal of that cause; and it is always a good rule of treatment to remove any external possible source of the disease that may exist, whether the real cause be internal or external; so that nothing is gained practically by a mere conjectural reference of the disease to one or the other source.

This view of the nature of epilepsy enables us, in some measure, to account for its paroxysmal character. The morbid excitability is not equal. It is liable to all the fluctuations of the healthy excitability. Excessive excitement diminishes or exhausts it for a time; the parts subsequently become insensible to ordinary causes of disturbance; and the actions remain healthy. Such an exhaustion is produced by the epileptic paroxysm, which therefore leaves the brain in its ordinary state until the excitability shall again accumulate. A strong cause of irritation may produce a paroxysm at any time, provided its strength be more than proportionate to the diminution of excitability. As the excitability accumulates, less and less of the cause is required to produce the paroxysm, and, when it becomes again greatly in excess, the paroxysm will occur under the operation of ordinary healthy influences.

The tumours, the spicula of bone, the thickened membrane, and all the other organic alterations within the brain operate in the same way. They act upon the portion of brain not organically affected as external sources of irritation. By their irritating influence they throw the brain into epileptic functional disorder. This diminishes or exhausts the excitability, so that the sound parts of the brain cease for a time to be sensible to the morbid influence. When the excitability is recovered, the organic cause is again felt, and again we have a paroxysm, and so on indefinitely. It is thus seen that, though the source of irritation may be always in existence, it does not follow that it should sustain a constant paroxysmal condition. Indeed, the organ could not long support such an excess of irritation.

It has been supposed that, in cases attended with the epileptic aura, the source of irritation probably exists in the point from which the sensation proceeds. This may be the case in some instances; but experience has shown that it is not always so; nor is the supposition at all necessary; for, though the sensorial centre may be the part really deranged, it very often refers the sensation to some point in the exterior with which it communicates. This is constantly the case in health. It is the brain which feels the pain of a wound, but it refers the sensation to the wounded part.

Habit has undoubtedly great influence in sustaining epilepsy. When the brain has once acted in an unusual manner, it much more readily acts in the same manner a second time, and at length falls into the new mode of action perhaps under ordinary influences, without the aid of the original cause. Individuals who are with the greatest difficulty put into the mesmeric state, I have known at length to be able to throw themselves into that morbid state at will. So it is also, in some measure, with epilepsy. The brain acquires a certain habit of acting, which may remain after the original cause has ceased.

It can be easily conceived how an epileptic patient should gradually fall into a state of dementia and paralysis. The brain, frequently stimulated to excess in the paroxysms, and engorged with blood, gradually takes on a slow inflammation, which in the end results in organic change. It is only another illustration of the general rule, that repeated irritation tends ultimately to inflammation. The healthy excitability of the organ is also impaired by the excess of irritation, and a state of debility ensues, because the brain ceases to feel duly the ordinary mental influences essential to just thought and proper feeling. Hence a gradual approach to imbecility, even independently of inflammation and organic change.

It is probable that the organic alterations found in old epileptic patients, indicative of chronic inflammation, have generally resulted in the manner above explained from the epilepsy itself. But sometimes they are the consequence of a continuance of an organic disease of the brain, in which the epilepsy may have originated.*

Diagnosis.—The only affections with which epilepsy can be confounded are apoplexy, certain forms of hysteria, and convulsions arising from some temporary cause, as meningitis, fever, the puerperal state, dentition, and intestinal irritation in children.

There can be no difficulty in distinguishing an ordinary epileptic fit, in its early stage, from apoplexy. The violent convulsions of the former, and the comparatively motionless state of the latter are sufficiently diagnostic. But, when the epileptic paroxysm has subsided into quiet coma, there may be more difficulty. The paleness of the face, however, in this stage, the comparative feebleness of the pulse, the foam at the mouth, the general absence of snoring, and the want of paralytic symptoms, though not absolutely certain criteria, are generally sufficient to enable the physician to draw a just conclusion. The comparatively brief duration of the epileptic paroxysm, and the previous history of the case, will also enter into the means of judgment. Sometimes the two affections appear to be associated; the patient having attacks closely resembling apoplexy, intervening between those properly epileptic.

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* Views have recently been put forth in relation to epilepsy by Dr. E. Brown-Séquard and others, which, though not subversive of the statements and opinions offered in the text, nay in some degree corroborative of them, yet merit attention for their ingenuity, the novelty of the facts and observations on which they are based, and their useful practical bearing. Dr. Brown-Séquard observed, in experimenting on the lower animals, that, when certain parts of the spinal marrow were wounded, in the third or fourth week after the injury, the animal operated on was apt to be attacked with convulsions of the epileptic character. Another very singular observation was that, if certain parts of the surface, points in the face for example, were pressed upon or otherwise disturbed, convulsive paroxysms were induced; while, if the nerves leading from them to the centres were laid bare, and then irritated, no such effect followed; showing that it was with the periphery where the nerve was distributed, and not with the nervous cord itself, that the relation with the nervous centres existed. Applying these facts to the elucidation of epilepsy, Dr. Brown-Séquard considered that the epileptic aura was of a similar character with the influence sent to the nerve-centres from these sensitive parts of the surface of the animal. As a proof that the influence proceeding from the sensitive points really causes the convulsions, they cannot be produced if the connection between the centre and circumference is cut off. Now this influence, called the aura, is not pain, nor anything like it; but a peculiar sensation unlike anything else, and possibly reaching the centre through distinctive nervous fibrils. As stated in a previous note, Dr. Brown-Séquard believes that, in a large proportion of epileptic cases, even where there is no sensible aura, a similar relation exists between the centre and certain parts of the surface, as where the aura is felt; that is, that there is often an imperceptible aura, or some influence analogous to it, proceeding from a certain exterior part to the nervous centre, giving rise to the epileptic fit. Epilepsy he conceives, as I have always maintained, to consist in an excessive excitability of certain portions of the nervous centres. This excitability only requires for its explosion, in the form of a fit, an irritant influence from the points of distribution with which its seat is especially associated; and the very important therapeutical inference is drawn that, if the connection between these points can be severed, the disease may be much ameliorated if not cured. With M. Foville, Professor Schroeder van der Kolk, and others, Dr. Brown-Séquard believes that the seat of the disease is not in the cerebral lobes, but in the medulla oblongata, pons varolii, or upper part of the spinal cord, and that the convulsion is a reflex action of these centres, provoked by excitation from without them. The loss of consciousness he very ingeniously explains, by adducing M. Bernard's great discovery of the capillary contraction produced by irritation of the sympathetic centres. The convulsions, then, in his view, are the reflex result of irritation of the medulla oblongata, while the coma results from the deficient supply of blood in the brain arising from contraction of the capillaries, caused by the irritation of the sympathetic nerve-centres in the medulla. In this point I cannot agree with Dr. Brown-Séquard. I have no doubt that the real seat of epilepsy is in the cerebral lobes, and even in the cortical portion of them. The various ways in which the mental functions are disturbed in epilepsy, often wholly independent of convulsive movements, as in the slighter cases of the disease referred to in the text, are, I think, inexplicable on the ground that the source of the phenomena is without the brain. Nor is it necessary to resort to the reflex nervous centres in the medulla oblongata or spinalis, to explain the convulsive movements, which may just as easily be accounted for by the substitution of an abnormal excitation for that of the will in the proper cerebral centres. (*Note to the sixth edition.*)

The diagnosis between epilepsy and hysteria will be given under the head of the latter complaint.

Occasional convulsions cannot be distinguished with any certainty from the epileptic, except by the circumstances which attend them. Thus, if the fit occur during the course of a febrile disease in children, from the irritation of swollen and painful gums, from obvious intestinal irritation, from acute meningitis, or from the disturbance of system attending the puerperal state immediately anterior or subsequent to delivery, there may be good reason to hope that the tendency to convulsions may pass away with the temporary cause; in which case, the affection would hardly be looked upon as epileptic, though it might be difficult to decide in what respect the convulsions differed in the two cases. In these occasional convulsions, there is very often a more sudden recovery of mental activity after the cessation of the convulsive movements, especially when the exciting cause is without the cranium. There is, too, perhaps, as a general rule, less foaming at the mouth, and less embarrassment of respiration. Should these convulsive fits be repeatedly experienced, at somewhat distant intervals, with a return to health in the mean time, there would be good reason to regard them as truly epileptic.

Epilepsy is for various reasons not unfrequently feigned; and it sometimes becomes necessary for the physician to decide whether the case is real or a counterfeit. If the individual be seen during the paroxysms, there can be little difficulty. In real epilepsy there is profound insensibility. In the supposititious, the sensibility remains, and may be acted on. Thus, the individual will sneeze if snuff be blown up his nostrils; will shed tears or make a motion of avoidance, if strong solution of ammonia or a burning match be held near the nose; will often start upon the occurrence of sudden loud sounds near his ears; or will show some signs of consciousness of what is said in his hearing, if ingeniously calculated to affect him strongly. Painful impressions made upon the surface, or threats of such impressions sometimes exceed his fortitude; but the former of these measures should in general be avoided in consequence of the subsequent effects on real sufferers. The froth at the lips is said to be sometimes imitated by means of soap in the mouth, but I should suppose that the imitation would be clumsy. The immobility of the pupil on exposure to light, the dark-red or livid turgescence of the face, the irregularity of the pulse, and the peculiar vacant or astonished look of the patient on recovery, are signs which cannot easily be counterfeited.

In the absence of the paroxysms, the counterfeiter wants the peculiar features of the habitual epileptic; does not usually display the marks of injury on his person from bruises, wounding of the tongue, &c.; and, upon inquiry, will generally be found to have selected his place for falling, and never to have had a fit unless when he supposed himself in the sight of others.

Prognosis.—When not dependent on any permanent organic disease, epilepsy may often be cured, if taken at the outset; and there is reason to believe that the germ of many an epileptic case is destroyed by the proper treatment of the occasional convulsions, which so frequently come under the notice of the physician. Cures sometimes also take place in cases of considerable duration; and there is no reason to despair in any case, unless obviously connected with incurable organic disease, or evidences of deteriorated brain. The longer, however, the disease continues, the less, as a general rule, is the probability of a favourable issue. After six months the chances are much diminished; and cases of a year's duration are often intractable, especially if, during that time, they have resisted judicious measures. When the disease appears before puberty, some hope may be indulged of a favourable change at that period. The cases dependent on some source of irritation exterior to the encephalon are more easily cured, as a general rule, than those in which the brain is exclusively affected; but there is always difficulty in ascertaining the fact of such dependence.

Congenital cases, or those beginning in early infancy, are generally unfavourable. So also are those which have supervened upon an attack of hydrocephalus. Inheritance usually gives obstinacy to the disease. The prognosis is always unfavourable, when, from long-continued and deep-seated pain in the head, or from evidences of a scrofulous or cancerous constitution, there is reason to apprehend the existence of tuberculous, carcinomatous, or other organic disease within the cranium. Epileptic patients scarcely ever recover, in whom a gradual deterioration of the mind, and the occurrence of paralytic symptoms, or rigid contractions of the muscles are observable. Dr. James Jackson, of Boston, has seen no patient recover, in whom the disease was attended with those very slight attacks already noticed under the name of *vertiginous spells.* (*Letters to a Young Physician*, p. 63.)

The disease often undergoes amendment without obvious cause, and the patient escapes his paroxysms so long that he begins to hope they may never return; but the favourable promise is very generally illusory. Many reputed cases of cure are probably of this kind. According to Herpin, permanent spontaneous cures take place in about four per cent. of the cases. (See *Brit. and For. Medico-chir. Rev.*, April, 1853.)

It is a fact often noticed, that a patient is apt to improve under any new medicine or plan of treatment, no matter what it may be. This is an evidence of the influence of the mind over the disease, and of how much a cheerful, hopeful, and confident temper may do towards ameliorating the condition of the patient. In judging of the effects of their remedies, practitioners should bear this fact in mind, and guard themselves against a too hasty conclusion in favour of certain remedies which they may have prescribed.

Treatment.—There is no one exclusive course of treatment applicable to epilepsy. It is necessary to consult the state of the system, to ascertain every irregularity of function or organization which can have any bearing on the disease, and to apply our remedies accordingly. The treatment divides itself into that which is adapted to the paroxysm, and that required in the interval.

1. *In the paroxysm*, little treatment is demanded. The patient should be placed upon a bed, with his head somewhat elevated; all tight parts of the dress should be loosened, especially about the neck and trunk; the air of the chamber should be fresh and pure; a piece of soft wood should be placed between the teeth to prevent injury to the tongue; and the convulsive movements should be restrained so far as may be necessary to guard the patient from injury. In general, the fit will spontaneously subside in a few minutes. Depletion or strong impressions of any kind are unnecessary; and the former may be injurious, if often repeated, by deteriorating the general health.

But, should the congestion of brain be so great as to threaten apoplexy, it would be proper to take blood from the arm, to make cold applications to the head, and produce revulsion towards the extremities by rubefacients, or by hot water if the movements of the patient will admit of its application. Should the paroxysm continue much longer than usual, or protracted coma follow, it will also be proper to bleed if the pulse be sufficiently strong; and cups or leeches to the temples and back of the neck may be used as adjuvants to the lancet, or as substitutes for it in doubtful cases.

When the pulse is rather feeble than strong, and the convulsions persist, enemata of assafetida or oil of turpentine may be administered. In the protracted paroxysm, after depletion, or when it is not required, the happiest effects sometimes proceed from ipecacuanha given as an emetic. The external application of certain nervous stimulants is also useful in some of these cases, especially in children. Garlic and brandy, or oil of amber mixed with olive oil, may be applied occasionally along the spine. The warm bath is beneficial in infantile cases.

Should danger from apnœa be apparent, ammoniacal liquid should be placed near the nostrils, sinapisms or hot water should be applied to the extremities, and, in cases of suspended breathing, the electro-magnetic current may be directed through the diaphragm, and recourse may be had to artificial respiration. Even Dr. Marshall Hall's proposed measure of tracheotomy might be employed, should the danger appear very imminent.

After the paroxysm has subsided, the patient should be kept quiet; and, if comatose symptoms continue, threatening serious mischief to the brain from persistent congestion, blood should be abstracted, generally or locally, according to the violence of the symptoms and the strength of the patient. Saline cathartics, and the warm bath may also be useful.

It is necessary, throughout the paroxysm and its sequelæ, to guard the patient from injuring himself or others. Sometimes, when maniacal violence is exhibited, it may be necessary to resort for a time to the strait-jacket. Individuals subject to epilepsy should not walk alone in the vicinity of water, even though shallow; for instances of death sometimes occur from falling with the face under water, even in a small puddle. Neither should they ride on horseback, or in an open carriage from which they may possibly fall, nor should they frequent precipitous places. It is recommended that epileptic patients, who are apt to be attacked during their sleep, should lodge in beds with a ledge around them, so as to prevent their falling out. But a better plan is to sleep on beds so low that falling out would do them no injury.

2. In the treatment of the interval, there are two prominent indications, namely, *first*, to remove all appreciable or possible sources of irritation to the brain; and *secondly*, to render that organ less sensitive to morbid impressions, or better able to resist them.

To meet the *first* indication, it is necessary to study well the state of the system, and, whenever any deviation from the healthy condition can be found, to remedy it if possible. If the blood-vessels are too full, and the blood too rich, it will be proper to administer occasional doses of the saline cathartics, to confine the patient to a diet exclusively vegetable, or of vegetables and milk, and to recommend moderate exercise so as to cause the blood to be daily expended by the various functions. This treatment may be confined to periods of temporary excitement, or may be continued for a long time when the tendency is strong and constant. In instances of inordinate excitement, it may be proper to take blood.

Should the patient, on the contrary, be anemic, the indication is scarcely less strong to correct this abnormal condition of the blood. When this fluid is deficient in nutritious qualities, all parts of the body suffer; and from all parts there go up to the brain intimations of this suffering, in order that, through the processes of circulation, respiration, digestion, &c., the deficiency may be supplied. The brain is the centre of communication between the suffering tissues and the organs, by the agency of which the suffering is to be relieved. The brain is, therefore, excited powerfully, and a state of great irritation is produced, which, though it may not exhibit itself in inflammation, is capable of inducing functional disorders, and among the rest convulsions. Anæmia, therefore, attending epilepsy, should be corrected; and excessive bleeding, even in plethoric cases, should be avoided for fear of inducing this condition. The chalybeates, simple bitters, sulphate of quinia, a nutritious diet, the cold bath if followed by reaction, sea-bathing, and passive exercise are the remedies here indicated.

Besides the general state of health, particular sources of irritation should be attended to. In infants, the gums should be lanced if swollen and painful, and other measures adopted to relieve the local inflammation. (See *Morbid Dentition*, i. 621.) Acidity of stomach, and other sources of gastric irritation should be corrected, and enfeebled digestion treated as directed for dyspepsia. (See *Irritation of Stomach*, i. 669.) Verminose affections should be met with the ordinary anthelmintics. Cases of epilepsy, dependent on tape-worm in the bowels, have been permanently cured by large doses of oil of turpentine. Constipation, deficient or deranged hepatic action, and any existing nephritic disorder should be corrected by appropriate remedies. A cure of epilepsy connected with splenitis has been effected by the continued use of aloetic purges. When epilepsy is associated with organic disease of the heart, little good can be expected from medicines; yet some relief may be obtained by pursuing the course recommended in these affections. Any existing disease of the kidneys should be corrected. Amenorrhœa should receive special attention, as also should other uterine disorders; but this is not the place to detail the necessary remedies. Dr. Prichard placed great reliance upon oil of turpentine in cases connected with uterine derangement; attention being paid of course to the general state of the system. Spinal disease must be treated by local depletion and counter-irritation.

Should a tumour exist in the course of a nerve, or a spiculum of bone serve as a point of nervous irritation, the offending cause should be removed, if possible, by a surgical operation. Cures are recorded, which have been effected in this way. When the epileptic aura exists, or when, as suggested by Dr. Brown-Séquard, pressure on any particular part, or galvanic excitement of that part, produces a paroxysm, efforts should be made to sever the nervous communication between the seat of the aura, or any similar concealed influence, and the brain. This may be attempted, when the point is in one of the extremities, by means of a ligature or the tourniquet; and it is said that the paroxysm may often be suspended by such a proceeding. Should this not succeed, Dr. Brown-Séquard recommends the application around the limb of a blister an inch wide, which he has known often to check the fits. (*Med. T. and Gaz.*, March, 1863, p. 325.) Another method, recommended by the same author, is to lay bare the nerve proceeding from the part, or a muscle if that be the starting-point of the aura, and apply sulphuric ether; and, if this fail, the nerve may be divided. The same practitioner has sometimes found the subcutaneous injection of narcotics in the vicinity of the part to effect a perfect cure. He recommends for the purpose half a grain of sulphate of morphia, one-sixtieth of a grain of atropia, and a minim of diluted sulphuric acid, with fifteen minims of water. Even amputation has been resorted to; and a cure of epilepsy is said to have been effected by Tissot, by cutting off the great toe in which the sensation of the aura commenced. In a case reported by Frank, in which the aura began in the testicle, a permanent cure is asserted to have followed castration. A division of the radial nerves is stated by Portal to have effected a cure, in a case in which the paroxysm began with violent pain in the index finger. But success, in cases of this kind, has scarcely been sufficient to justify a resort to such extreme measures as amputation or castration under ordinary circumstances. Blisters, setons, and caustic near the seat of the aura have sometimes answered; but the actual cautery is more effectual. (*Brown-Séquard.*) Many cures are reported as having been effected by the operation of trephining, whereby depressed or diseased portions of the skull have been elevated, or spicula of bone penetrating the brain have been removed. Instances of this kind have occurred, in our own country, to Dr. Dudley, of Lexington, Dr. Rogers, of New York, and Dr. Guild, of Alabama. (See *Am. Journ. of Med Sci.*, ii. 489, and iv. 97.) Such an operation might be justifiable in severe cases of the disease, in which a fixed pain in one part of the skull, with tumefaction, might indicate disease of the bone, or in cases following a blow or fall upon the head, and probably dependent on depressed bone. But that it should be resorted to, in ordinary cases of epilepsy, upon the principle of relieving the brain from pressure, or with the vague hope of discovering and removing the offending cause, is hardly consistent with sound therapeutical principles. According to Dr. Brown-Séquard, the most efficient method of treating epilepsy is the application of a series of moxas along the spine, and especially at the nape of the neck. Should the disease be associated with syphilitic affection of the skull or pericranium, a course of mercury, or of the iodide or bromide of potassium, should be resorted to. Cures of epilepsy have sometimes followed a cure of syphilis by means of mercury. Dr. Fuller has used biniodide of mercury with advantage, in some cases in which he supposed thickening of the dura mater, or a deposit between it and the bone, to exist. (*Med. T. & Gaz.*, Feb. 1857, p. 167.)

In order completely to fulfil the first indication, it is necessary to correct those habits, or counteract those exterior influences, which may have caused, or may sustain the disease. All sensual excesses, including the habit of masturbation, must be abandoned; and, to aid the patient in overcoming his vicious propensities, dulcamara or other reputed antaphrodisiac medicine may be employed. Regular and moderate occupation, not calculated to overtask the mental or bodily powers, is among the most efficient measures for accomplishing this purpose. Excessive and premature mental exertion is highly injurious. All excess of the passions, of whatever kind, should be avoided. It need scarcely be said that abandonment of intemperate drinking is absolutely essential. In those cases in which the paroxysm is apt to occur in the night, the patient should avoid suppers, and should lie with his head elevated.

Under this head may also be ranked the use of revulsive measures, calculated to call off irritation from the brain, and to fix it in some safe external position. When the disease has followed the cure of a cutaneous eruption or an old ulcer, or the retrocession of a gouty or rheumatic disease, the measures alluded to are especially important; and, under these circumstances, they should be applied to the original seat of the affection. In other cases, they may be applied to the nape of the neck, behind the ears, or between the shoulders. Repeated blistering, pustulation by tartar emetic or croton oil, issues, setons, and cauterization by moxa are the means referred to. Several cases have been related of the efficacy of tartar emetic ointment, rubbed upon the scalp so as to induce free suppuration. (See *Ranking's Abstract*, vii. 174.) In cases attended with evidences of chronic inflammation of the brain and its membranes, it may not be amiss to make an incision, as has been recommended, on the top of the scalp, along the sagittal suture, and to keep it open by means of issue peas. A remedy, however, so harsh and disagreeable should not be thoughtlessly resorted to. It may be proper, also, in some comatose cases, to blister the whole scalp, once or oftener.

The *second* indication of treatment, during the interval, is to diminish the excitability of the brain, so as to render it less sensible to irritant impressions, or better able to resist them. The remedies calculated to meet this indication are the narcotics, which diminish the sensibility of the brain; and the tonics and nervous stimulants, which strengthen the nervous system, and tend to equalize its excitement. These remedies may often be advantageously conjoined. Of course, before they are resorted to, the system should, in compliance with the first indication, be freed as far as possible from any incompatible state of disease that may exist.

Of the tonics, those derived from the mineral kingdom are usually preferred. Nitrate of silver holds, perhaps, the highest rank among them. Many cures by that medicine have been reported, and its occasional efficiency in purely functional cases of the disease can scarcely be doubted. It should be given at first in doses of one-quarter or one-third of a grain, three times a day, to be gradually increased to one or two grains. The dose has sometimes been enormously increased, and even a scruple has been given daily. But this is an abuse of the remedy, and may lead to serious evil. The mucous membrane of the stomach may be corroded, and a permanent dark stain fixed upon the skin. Esquirol mentions the case of a woman who had taken the nitrate for eighteen months, and whose stomach, upon her death at the expiration of that period, was found destitute of the mucous membrane over one-half of its inner surface, and in several points corroded to the peritoneal coat. Of the discoloration numerous instances are on record. I have not seen these effects in my own practice, though much in the habit of employing the salt; but I never exceed the quantity of a grain three or four times a day, and never continue the remedy longer than two or three months, without an intermission of as many weeks. The chloride, iodide, or oxide of silver might be substituted for the nitrate, with less danger of irritating the stomach. I should expect from them, however, the same effect upon the skin, if used very largely. For the dose of these medicines, the reader is referred to the dispensatories.

Next, probably, in efficacy to the nitrate of silver, are the salts of copper. Either the sulphate of copper, or ammoniated copper may be used. I have seen apparent benefit in epilepsy from a mixture of the latter of these preparations with assafetida. They should be employed in doses insufficient to irritate the stomach, and continued steadily for months. Both with these preparations and with nitrate of silver, a little opium may in general be usefully associated.

The preparations of zinc have also been used with asserted benefit. The sulphate and oxide are those usually employed. The oxide to be efficient must be given in large doses. From five grains at first, the dose may be increased to ten or fifteen grains three times a day, if found not to offend the stomach. Valerianate of zinc has recently come into notice, and is said to have been used advantageously in the dose of a grain or two several times a day, increased as the stomach will bear it. Lactate and phosphate of zinc have also been recommended.

The preparations of iron may be employed with the same view; but, except in cases associated with anæmia, they might sometimes do harm by inducing a plethoric state.

Acetate of lead is said to have effected permanent cures in some cases; and its influence in directly depressing nervous action, when freely taken, would render this result probable; but it should be used with caution.

Of the vegetable tonics a large number have been employed, but none probably with much other effect than to improve the digestion, except Peruvian bark or sulphate of quinia, which might be expected to produce favourable effects in functional epilepsy, from its influence upon the brain. It is especially adapted to cases which assume a regular periodical form. The same exception may be made in favour of strychnia.

Cod-liver oil, which probably acts by improving the nutrition, removed the fits in six out of twelve cases, in which it was employed by Dr. Anstie. The remedy was used persistently in one case for three months, and in another for six; and in both the disease was serious, having in one instance, that of a girl of 17, originated in infancy. (*Med. T. and Gaz.*, April, 1862, p. 860.)

Of the antispasmodics, or nervous stimulants, valerian has probably enjoyed most credit. Assafetida, musk, and camphor have been much used; and formerly some reliance was placed on Dippel's animal oil, which, however, has gone out of use. I have seen a monthly recurring case, in a young female, yield apparently to cimicifuga or black snakeroot.

Among the narcotics, stramonium and belladonna are probably the most efficacious. When the system is free from plethora, opium might sometimes prove useful; but it must be employed with caution.

Ergot is employed by Dr. Brown-Séquard, under the impression that it produces contraction of the cerebral capillaries.

In the condition of great cerebral irritation, approaching or amounting to insanity, which sometimes follows an epileptic paroxysm, and may even occur without any immediately preceding convulsive attack, I have obtained the happiest effects from a mixture of chloroform and camphor, made into an emulsion with water by means of the yolk of an egg. From forty to sixty drops of the chloroform and five grains of the camphor, in a tablespoonful of the mixture, may be given every hour or two till relief is obtained, or it shall be found inapplicable to the particular case. I have seen it produce perfect calmness almost instantaneously.

A great number of remedies have been given empirically in epilepsy, and acquired a temporary reputation, to be lost, revived, and lost again, in the fluctuation of medical experience. There can be no doubt that many wholly inert substances have attained some credit, partly from having been given on one of those occasions when the disease was about to undergo spontaneously a temporary amelioration, and still more, it is probable, from the influence of novelty, hope, &c. on the mind of the patient, and through this on the condition of his brain.

Some years since *indigo* attracted considerable attention. It is asserted to have been effectual in many cases. A scruple may be given at first, and gradually increased to one or even two drachms, three times a day; and the medicine must be continued for two or three months. It is usually associated with some aromatic powder, and if it purge should be combined with a little Dover's powder. *Artemisia vulgaris* or mugwort, an old remedy in this complaint, has been revived in Germany. A species of *scutellaria*, given freely in the form of decoction, has been successfully used by Dr. R. W. Evans, of West Canada. (See *Am. Journ. of Med. Sci.*, N. S., xvii. 495.) Dr. Thos. Salter, of Poole, and Dr. Joseph Buller, of Southampton, England, claim extraordinary powers for the inspissated juice of the *Cotyledon umbilicus* (*Ibid.*, xviii. 214); and the late Dr. Graves, of Dublin, related several cases in which it appeared to effect cures, or to afford relief. (*Dub. Quart. Journ. of Med. Sci.*, xiv. 257.) M. Michea found *valerianate of atropia* successful in six cases of the recent disease, originating in moral causes. (*Va. Med. and S. Journ.*, ii. 285, from *Gaz. Méd. de Paris.*) Cures are said to have been effected by the *Selinum palustre* of Europe (*Herpin*); and the same is asserted of the bark of the black elder (*Sambucus nigra*), given in the form of infusion in anticipation of the paroxysm, and repeated every week. The *oils of turpentine* and *cajeput* have been recommended. The *mistletoe*, *peony root*, and *orange leaves* are old remedies. Various aromatic, stimulant, and antispasmodic mixtures have met with partial and temporary success. Of this nature is the mixture of equal parts of powdered *sage*, *ginger*, and *mustard*, of which a teaspoonful given three times a day is said to have effected some cures. *Cantharides*, *phosphorus*, and *galvanism* or *electricity* have had their advocates. Dr. Jonathan Osborne, of

Dublin, has met with extraordinary success from the joint use of digitalis and tincture of cantharides, given so as to produce their characteristic effects; care having been previously taken to remove any obvious source of cerebral irritation; and the cold douche being, in most instances, applied to the occiput morning and evening during the treatment. (*Dublin Quart. Journ. of Med. Sci.*, Nov. 1856, p. 349.) *Strychnia* may be employed with some hope of advantage in paralytic cases. *Emetics*, repeated every three or four days, have had the effect of postponing the paroxysms, and are reputed to have cured the disease in some instances. *Mercury* will no doubt occasionally prove serviceable, by correcting some of the organic affections without or within the cranium, which may have produced, or may aggravate the disease. Sir Charles Locock has found *bromide of potassium*, in doses of from five to ten grains, remarkably successful in hysterical cases. (*Med. Times and Gaz.*, May, 1857, p. 491.) Similar advantage has followed its use in other forms of epilepsy, in the hands of Dr. Wilkes, M. Bazin, and others; and there can be little doubt that it often relieves the disease, and sometimes seems to cure it; though it often also fails. M. Bazin gives about thirty grains daily, one-half in the morning and the other in the evening, and every five days the dose is increased by fifteen grains in the day, until the whole daily amount equals two drachms. When the symptoms are decidedly modified, the dose is diminished gradually to a drachm daily, which may be continued for several months, even after the attacks have ceased. (*B. and F. Medico-chir. Rev.*, July, 1865, p. 239.) Allusion has already been made to the cautious use of *opium* as sometimes beneficial. Dr. Matthew Corner, in a letter to the *Lancet* (April 16, 1859, p. 401), speaks in strong terms of the efficacy of this remedy in epilepsy; enough being given to keep the system slightly under its effects, and the time for its administration being preferably chosen in anticipation of the paroxysm, when this returns somewhat regularly.

Dr. Marshall Hall has proposed the operation of *tracheotomy*, on the ground that spasmodic closure of the glottis in epilepsy is a necessary element in the convulsion; but the operation has not been attended with such success as to justify its employment, unless in extraordinary cases, in order to prevent asphyxia. Another physical measure which has been proposed, and occasionally tried, is to tie one or both of the carotids; and still another, to secure the arteries which supply the soft parts without the cranium, the temporal for example, with the view of diminishing intra-cranial congestion by cutting off the supply of blood through the bone. But neither operation has been followed by very satisfactory results.

The patient may sometimes succeed in keeping off a paroxysm when he has warning of its approach, by smelling ammoniacal substances, or one of the nervous stimulants, as musk or assafetida. Dr. Eberle knew an epileptic individual, who used to produce this effect by drinking freely of cold water in anticipation of the fit. Anything that will make a strong impression on the nervous system, whether directly, or through the mind, will often have the same effect. Allusion has already been made to the plan of arresting the paroxysm, in cases attended with the epileptic aura, by a ligature or tourniquet around the limb.

Dr. Ramskill, of the Hospital for the Epileptic, in London, has employed the *inhalation of oxygen*, with much apparent benefit, in a cachectic case, supposed to be of syphilitic origin, and has since used the remedy in other cases. He administers it by causing air to be inhaled through a glass inhaling apparatus, one-third full of solution of peroxide of hydrogen, which must be highly charged with oxygen, as otherwise the gas is not given out sufficiently. The inhalation is continued till some sensible effect is produced on the pulse or the feelings; and the slightest giddiness is a sufficient proof of its action. (*Med.*

T. & Gaz., July, 1863, p. 11.) Dr. Wm. Murray has exhibited chloroform by inhalation, giving ten drops three times a day, and continuing the treatment for eight weeks or more, in a very bad case, with very great advantage. (*Ibid.*, June, 1864, p. 612.) In several other cases he has used the remedy with more or less benefit, and in a few without apparent effect. He never aims at producing unconsciousness, and gives the medicine regardless of the fits. (*Ibid.*, April, 1865, p. 357.) Prof. Laycock, of Edinburgh, has found considerable advantage from the use of sternutatories, employed both during the paroxysm and in the interval. He first tried strong solution of ammonia and common snuff, but afterwards extended his experiments to other errhines, as white hellebore and Cayenne pepper. (*Ibid.*, May, 1865, p. 463.) Dr. John Chapman has employed his ice-bags to the spine with encouraging success. (*Ibid.*, July and Sept. 1865, pp. 57, 248, and 275.)

Dr. James Jackson, of Boston, has found no remedial measure so effectual as a diet almost exclusively of vegetable food, with occasionally, when the health is at the best, milk, butter, or eggs, which, however, must be used cautiously, and mixed with farinaceous substances, as in puddings. Under this diet he has seen many recoveries; though it has often failed. He has never known a case to end favourably, after an unsuccessful trial of this diet, and has little confidence in medicines. (*Letters*, &c., p. 67.)

Article VIII.

CHOREA.

Syn.—*St. Vitus's Dance.—Chorea Sancti Viti.—Danse de Saint Guy.*—(French.)

CHOREA (from χορεια, a dance) is characterized by involuntary muscular contractions, without loss of consciousness, and without entire loss of the power of the will. The contractions are somewhat peculiar, being neither rigid and persistent like those of tetanus, nor so quick and jerking as those of ordinary convulsions, but rather resembling the voluntary movements, for which they may be easily mistaken. The name of St. Vitus's dance is said to have arisen from the custom, formerly prevalent, for those affected with the disease to make a pilgrimage to the shrine of St. Vitus, called by the French St. Guy, near Ulm, where they were miraculously healed.

Symptoms, Course, &c.—Chorea in general comes on gradually, and is often preceded by symptoms of gastro-enteric derangement, such as irregular appetite, constipation, swollen abdomen, &c., which are sometimes also accompanied with depression of spirits, or other signs of nervous disorder. The first unusual movements are often noticed more especially in some one part of the body, as the face, the shoulders, or the hands; the patient making ludicrous grimaces, or shrugging the shoulders, or incessantly working with the fingers, and perhaps incurring blame for behaving rudely, or acting absurdly, as if the motions were voluntary. But they are soon found to be beyond the control of the will. The irregular muscular action increases, and at length the whole body becomes more or less involved. Head, trunk, and extremities are in almost constant movement. The features undergo various whimsical distortions, as if the patient were making faces for the amusement of the spectators. The head is moved grotesquely upon the neck; the limbs execute diversified, meaningless little gesticulations; and the muscles of the trunk pull it now one way and now another, making the patient appear exceedingly fidgety, without greatly altering his position. If any voluntary motion is attempted, there is a curious and often ludicrous mixture of the regular and irregular actions of the muscles, which seem to be influenced by two opposite forces; but unless the disease be very violent, or the object aimed at require some nicety or steadiness of movement, the will is generally in the end successful. Thus, patients cannot use the hand in writing, sewing, &c., but they can ordinarily convey objects to their mouth, or move from one place to another, though, in accomplishing the former object, the arm is jerked about in various opposite directions before it reaches the point aimed at, and, in attempting the latter, the body often goes through numerous zig-zag operations, advances with a sort of hitching gait, and as if one foot were dragged after the other, and not unfrequently falls.

The interior muscles of the mouth and of the fauces may participate in the morbid action; the tongue is rolled out occasionally between the lips; the patient stammers or hesitates in speaking; and even deglutition is sometimes performed with difficulty.

In very bad cases, the patient loses the power of maintaining a standing or even sitting posture, and is compelled to lie in bed. One side is sometimes observed to be much more affected than the other. It seldom happens that the muscles are entirely quiescent, except during sleep, when the motions usually cease entirely, or are very much diminished. In some instances, however, they are so incessant as to interfere with sleeping. The disease is subject to exacerbations and remissions; and sometimes assumes a paroxysmal, and even an irregularly periodical or intermittent character. Indeed, cases have been noticed in which there was considerable regularity in the return of the paroxysms, with entire exemption in the interval.

The irregular motions are often greatly increased by any emotion; and it has been noticed that the patient is generally worse when conscious that others are observing him. It appears that, if the will cannot accurately regulate the movements of the muscles, it has the power of calling them into abnormal action; for the spasmodic contractions are much more frequent when the patient endeavours to execute any movement with peculiar precision, than when the will is quiescent. By the exertion of a strong determination, the patient can also often control the muscles in some degree, so as to keep them quiet for a time, though, if he allows or encourages them to move, it is impossible to prevent them from moving in their own way.

Chorea is sometimes attended with headache. The bowels are generally constipated, and the discharges often unhealthy. The appetite is in some instances natural, in others morbidly craving, deficient, or capricious. There is no fever. It is a singular fact, noticed by writers, that there is much less sense of fatigue in consequence of the incessant muscular action, than would result from an equal amount of it under the direction of the will. The temper is not unfrequently affected. It is more capricious, excitable, or apprehensive than in health. The patient often weeps without apparent cause, or is gloomy, or apathetic, in short, evinces various nervous disorder not unlike that attendant upon hysteria, which is, indeed, not unfrequently associated with this disease, when it attacks females about or beyond the age of puberty. The mental disturbance sometimes amounts to delirium.* Neuralgic affections, moreover, are not uncommon in patients who have been labouring under chorea; and some authors have noticed a connection between the latter complaint and rheumatism of the muscles, pericardium, and spine.

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* In a communication to the Paris Academy of Medicine (March 22, 1859), M. Marcé called attention to various mental disturbances attendant on chorea, among which, besides the changes of temper and feeling, and of intelligence, referred to in the text, he speaks of hallucinations and even mania as sometimes supervening. The hallucinations come on in the evening, in the state between waking and sleeping, or more rarely in the morning on awaking. They are often limited to the sense of sight, but sometimes extend to general sensibility, and even to the hearing. Though met with in pure chorea, they are infinitely more frequent when the complaint is associated with hysteria. In the great majority of cases, the hallucinations are of no serious importance; they may, in exceptional instances, lead to excitement and delirium. When complicated with mania, either at the commencement or in its course, chorea must be considered as very dangerous; as in more than half the cases it proves fatal in the end, and, even in those which

The course of chorea is not uniform. Under proper treatment, it may continue only a few days, or it may run on for months or years. There is reason to believe that it will generally, sooner or later, cease spontaneously. When long continued, it is thought to weaken the mental powers; and it is accused of inducing imbecility, epilepsy, paralysis, &c. The probability is, that these affections, when they occur, are merely effects of a common cause with chorea, and not the results of that disease. A partial palsy of the limbs sometimes follows a convulsive paroxysm.

Instead of affecting the whole body, chorea is sometimes confined to a single part, as to the face, a leg, or an arm; and the patient, though well in all other respects, is unable to prevent himself from making the most uncouth, whimsical, or ludicrous movements of this part, which subject him occasionally to inconvenience and mortification. I know an instance of this kind, in which a gentleman gives now and then offence to strangers by making faces, as if mocking or laughing at them, when in fact perfectly serious and well-disposed. This partial chorea is more difficult of cure than the general, and not unfrequently continues during life. It is probably, in many instances, rather the result of early habit confirmed by time, than a real disease.

Dr. Addison has called the attention of the profession to the frequent existence of a bellows murmur of the heart in chorea. It accompanies the first sound, and though sometimes aortic, is more frequently mitral. It is probably dependent in general upon anæmia, which, if the views of the heart's actions given at page 137 of this volume are correct, may readily produce the mitral as well as the aortic murmur with the first sound. Dr. H. Bence Jones has found the urine deficient in the phosphates, but with great excess of the sulphates and urea, ascribable to the excessive muscular action. (*Lond. Med. Gaz.*, July, 1851, p. 81.)

Another morbid state is frequently ranked with chorea, though, as appears to me, improperly. The affection alluded to consists in an irresistible propensity to make and repeat incessantly, and without reason, certain strange motions, such as dancing in a whimsical manner at the sound of a musical instrument, jumping, whirling the body rapidly round upon the heel as a pivot, rotating the head backward and forward, beating the hand incessantly upon the knee, and a thousand other extravagances, such only as a diseased imagination could suggest. In these cases, the movements are voluntary, and therefore quite different from those of chorea. They are the result of a species of insanity, controlling the will, or possibly sometimes a mere derangement of the will, without involving the general emotional or intellectual functions, a kind of monomania of the motor faculty of the brain.*

eventuate less unhappily, often leaves behind intellectual disturbances of various duration. Inhalation of chloroform, prolonged baths, and antispasmodic remedies are the therapeutical measures, which, according to M. Marcé, have hitherto proved most useful in these cases. (*Arch. Gén.*, Mai, 1859, p. 622.)—*Note to the sixth edition.*

* An affection has been described, with the designation of *electrical chorea*, by an Italian physician named Dubini, which, however, appears to me to have a closer relation to epilepsy than to the disease under consideration. It consists in rapid and almost constant movements of certain muscles, resembling those produced by electrical shocks, with violent convulsive paroxysms in the same muscles, recurring twice or oftener in the day, attended by a rapid pulse, and followed by profuse sweating, and a more or less complete temporary paralysis of the part affected. At first the disease is confined to a limited space, as to a finger, an extremity, or one side of the face; but gradually it extends to the whole of one side of the body. The same identical muscles are always the seat of the convulsive movements, which are generally also limited to one side of the body, and that the right side. As the disease advances, the convulsions become more

Anatomical Characters.—The evidences which anatomy affords of the nature of chorea are entirely negative. In uncomplicated cases, in which death has occurred either from the disease, or from some accidental cause, the brain and spinal marrow have, in many instances, after the most careful scrutiny by the most skilful pathological anatomists, been pronounced quite healthy. It is true that others have observed various lesions, such as serous effusions into the meningeal cavity of the spinal marrow, injection of the spinal marrow itself, injection, softening, &c. of the brain and its membranes, serum in the ventricles, and tumours and calculous concretions in the encephalon. But these were obvious complications, the results of diseases altogether independent of the chorea in their origin.

Causes.—An unsteady, excitable state of the nervous system constitutes a predisposition to chorea. Such a state is apt to attend a feeble condition of the general health; and hence the disease has been frequently observed in individuals with disordered digestion, and defective nutrition; but this is by no means universally the case, and, in many instances, it has come on in persons previously healthy and robust. A predisposition to chorea is said to be often inherited.

Age has great influence over the occurrence of the disease. It very seldom attacks either young infants or old persons, and is beyond all comparison most frequent between the ages of six or seven and fifteen, that is between the second dentition and the period of puberty. During my connection with the Pennsylvania Hospital, I recollect only three instances in which the disease existed in adults. Two of these were females between twenty and thirty years old, in whom the complaint was complicated with hysterical or epileptic convulsions, and the other a man of about forty-five or fifty, in whom it had long existed. Nevertheless, no time of life is absolutely exempt; and cases now and then occur both in infancy and old age. A case is on record in which the patient was eighty-three. It would appear that the modifications produced in the nervous system by the irritation of the second dentition, and the changes connected with the development of the sexual functions, are favourable to the attacks of chorea.

Sex also has a powerful influence. Females are much more liable to the disease than males. From a comparison of numerous statistical reports on this point, it results that the proportion of females is between two-thirds and three-quarters of the whole number.

M. Rufz has inferred from his inquiries that the disease is little known in hot climates, and consequently that the rigorous or changeable weather of northern latitudes predisposes to it; yet it is said to occur more frequently in the hot than the cold seasons of the year.

Whatever tends to debilitate the system generally, and to impoverish the blood, may be considered, in connection with age and sex, as predisposing to

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incessant, and sometimes invade the other half of the body. The least touch will occasionally bring on the most violent clonic spasms of the whole of the side affected. Articulation is difficult during the paroxysms. Towards the close of the disease, the convulsions give way to coma, and the patient at length dies with apoplectic symptoms. Sometimes pain in the head or spine precedes the attack. The intellect does not appear to be disordered until the supervention of the comatose phenomena. The appetite is at first good, but ultimately fails. Most of the patients void worms.

The duration of the complaint is from one to five months or more. It is almost always fatal. Dissection has failed to reveal its nature. Venous congestion of the cerebral and spinal meninges is the only uniform abnormal condition observed. The persons attacked are usually between the ages of seven and twenty-one. In the majority of cases the disease could be traced to fright, but in some no cause could be discovered.

Various treatment has been tried, but none for which decided efficiency could be claimed. The best palliative appeared to be extract of hyoscyamus. (*Med.-chirurg. Rev.*, October, 1846; from *Annal. Universal*, vol. 117.)—*Note to the second edition.*

chorea, through the frequent disturbance which such a state of system occasions in the nervous centres.

The exciting causes are strong and disturbing emotions, especially terror; excessive excitement of all kinds, whether mental or bodily, and the consequent over-exertion of the faculties; various extra-cranial irritations, as those of dentition, decayed teeth, disordered stomach and bowels, hepatic derangement, worms, uterine disease, spinal tenderness, &c.; suppression of the menses, repelled cutaneous eruptions, and translated rheumatism; depraved habits of life, and especially masturbation; and, finally, various organic affections of the brain and spinal marrow, which sometimes combine the symptoms of chorea with others more characteristic, as epilepsy, fatuity, and paralysis. It is said that females, affected with chorea at the approach of puberty, are almost always relieved of it upon the establishment of the menstrual function, proving the great influence which disorders of that function may exercise in the production of the disease.*

Nature.—Of the nature of chorea we know little or nothing more than that it is a functional disease of the brain. That it is not organic is proved by the absence of the ordinary symptoms of such disease, and by the evidence of dissection. Some believe that it is essentially an affection of the spinal marrow; and that the involuntary movements are owing to the reflex action of the nervous centres in that structure. But the following considerations are opposed to this view. The motions are unlike those believed to proceed directly from spinal irritation, as the spasms of tetanus, and those induced by nux vomica, and much more closely resemble the voluntary motions, which are all of cerebral origin. The irregular movements of chorea can in some measure be restrained by the will, which would hardly be the case were they spinal. They cease generally during sleep, in this respect differing from the movements springing directly from the spinal marrow, which does not sleep. The headache which not unfrequently accompanies the complaint is further evidence of its cerebral locality. It is probably a perversion of that function of the brain through which the will acts; rendering it partially subservient to other powers than the legitimate one. An intimate association between chorea and pericarditis or endocarditis has been noticed by some writers; and the complaint has been ascribed, by Dr. Begbie and others, to a rheumatic constitution of the blood. It is very possible that rheumatic irritation affecting the cerebral centres may occasionally be an exciting cause; and acute rheumatism has undoubtedly been sometimes associated with chorea. The frequent existence, moreover, of cardiac murmurs has tended to give plausibility to the theory. But, though chorea frequently came under my notice in hospital practice, I never happened to meet with it connected with rheumatism, or with positive evidence of cardiac inflammation. The murmurs I believe to be generally dependent either on the anemic state of the blood, which is a frequent attendant, or on irregular contraction of the columnæ carneæ under disordered nervous influence.

Diagnosis.—This is seldom difficult. The absence of fever, coma, delirium, and rigid spasm, together with the whimsical and often ludicrous character of the movements, and the partial control of the will are sufficient to distinguish chorea from all other diseases of the brain or spinal marrow. There are, however, cases in which this disease is in various degrees complicated with epilepsy, hysteria, and palsy; and it is not always easy to determine how much belongs to the one affection, and how much to the other.

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* Sometimes the disease appears to have occurred epidemically; numerous persons being attacked in one locality, perhaps in a single hospital or other institution in which females are associated. There can be no doubt, however, that these cases originate in the imitative principle of our nature, which in nervous affections, and especially in women, is apt to induce attacks simply by the sight of it in others. Such an epidemic, which broke out in one of the wards of the Hospital Necker, under the care of M. M[illegible]nerat, was immediately arrested by the complete isolation of the persons affected. (Dr. Bricheteau, *Arch. Gén.*, Avril, 1868, p. 483.)—*Note to the sixth edition.*

Prognosis.—Pure chorea is very rarely fatal. Nevertheless, instances have occurred in which the system has been worn out by its violent and incessant agitations, or in which some vital function has been interrupted sufficiently long to occasion death. In complicated cases, as when cerebritis or myelitis is associated with symptoms of chorea, it is not this disease, but the accompanying affection that is dangerous. The probability is, that the disease would, in most instances, sooner or later end favourably without the interference of medicine. By proper treatment, timely employed, its course is undoubtedly much shortened, its inconveniences greatly diminished, and what little danger may belong to it generally obviated. Its duration, under treatment, varies from a few days to several months; but on the average may be stated at from two to six weeks. A few cases will not yield to remedies, and run on for years, or indefinitely; and this is more especially apt to happen with those in which the long continuance of the disease has added the force of habit to the other causes. In the course of my practice, I have met with only one instance of pure chorea which resisted treatment. This was the case already alluded to, of a man of middle age who entered the Pennsylvania Hospital with the disease already inveterate, and who left the institution, after a residence of several months, uncured. What a longer continuance of treatment might have effected cannot be determined. It is said that the local affections, before described as being usually classed with chorea, are much more obstinate than the general, and are often quite incurable. Relapses in this disease are not uncommon.

Treatment.—The indications are *first*, to remove all obvious disease which may exist independently of the involuntary movements, and *secondly*, to give vigour to the nervous system, and equalize its actions.

1. Constipation should be promptly corrected by cathartics. It is highly probable that purgation is useful, not only by removing a source of irritation from the bowels, but also by acting revulsively from the brain, and by depletion in plethoric cases. Repeated daily, or every second or third day, as the strength will permit, cathartics will often of themselves cure the complaint in the course of a few weeks. Some discrimination should be exercised in the choice of the medicine. Should the system be plethoric, sulphate of magnesia, or one of the saline cathartics, senna and salts, or jalap and bitartrate of potassa, would best answer the purpose. Acid in the stomach would indicate magnesia; debility of digestion with dyspeptic symptoms, rhubarb; amenorrhœa, aloes or black hellebore; deficient or disordered hepatic action, calomel or the blue mass. The coexistence of several indications should lead to accordant medicinal combinations. Care should always be taken not materially to debilitate the patient, or irritate the stomach.

In cases attended with headache, advantage will often accrue from local bleeding, which would be especially called for by the existence of a flushed face, and a full strong pulse, indicating active congestion of the brain. There may even be instances in which it would be proper and requisite to take blood from the arm. But these are rare. I have never seen a case of uncomplicated chorea in which it appeared to me that general bleeding was indicated. If abused, it may do harm by inducing anæmia, which, as before explained, would probably aggravate the cerebral symptoms.

Spinal tenderness would require cups or leeches to the tender spot, followed by repeated blisters, or antimonial pustulation. Amenorrhœa, if existing, should be treated by appropriate measures. (See *Amenorrhœa.*) Chlorosis or anæmia would demand the chalybeates. For worms in the bowels, anthelmintics should be added to the cathartic medicine; and oil of turpentine, or oil of chenopodium, would be especially applicable.

2. Measures for fulfilling the second indication should in general be employed conjointly with those which may be deemed necessary, in accordance with the first. The only exception to this rule, are those rare cases in which there may be plethora and cerebral congestion. In these it is proper to postpone the measures referred to, until by purging, leeching, low diet, &c., the excitement shall have been sufficiently subdued.

To give strength and equability to the nervous actions, tonics, and antispasmodics or nervous stimulants are required. Of the former class, though sulphate of quinia is sometimes very efficient, the mineral tonics are generally preferred. The preparations of iron and of zinc are, on the whole, the best and safest. Of the former, subcarbonate of iron may be given in the dose of a scruple or half a drachm twice or three times daily, with a little ginger to qualify its effects on the stomach; but any one of the officinal preparations may be selected; and ferrocyanide of iron, or Prussian blue, has been specially recommended. Of the preparations of zinc, the sulphate has probably been most used, and is often very efficient. It is the tonic which I most frequently employ in chorea. It should be given in quantities as large as can be borne without irritating the stomach. Two grains, given at first three times a day, may be gradually increased to six or eight grains. The oxide and valerianate of zinc have also been used; but they have no decided advantage over the sulphate, and the oxide is less certain. Besides the metallic tonics mentioned, sulphate of copper, ammoniated copper, nitrate, oxide, chloride, and iodide of silver, and subnitrate of bismuth have been used; but they have no superiority over those first mentioned, while most of them are liable to act more harshly upon the stomach. Iodide of zinc is preferably employed by Dr. Barlow, of London, in cases complicated with struma. (*Lond. Med. Times and Gaz.*, Aug. 1857, p. 195.) Strychnia has been found successful in several instances; two cases under the care of Dr. Fuller having recovered in a fortnight, though the remedy failed in a third. (*Ibid.*, Jan. 1859, p. 99.) Cod-liver oil has a strong advocate in Dr. C. B. Radcliffe, who also recommends phosphorus in this and other chronic convulsive affections. (*Braithwaite's Retrosp.*, No. 48, p. 33.)

With the tonic which may be selected, it will be proper to combine the use of one of the nervous stimulants. Valerian has enjoyed much reputation in chorea, and will often act advantageously. Assafetida is highly beneficial in many instances, especially when the disease is associated with hysteria. Camphor and musk have also been recommended. But the remedy of this class which I prefer in chorea, is our indigenous cimicifuga or black snakeroot. This was introduced into use by Dr. Jesse Young, and is much employed. I have, in repeated instances, found it of itself adequate to the cure of the disease. From half a drachm to a drachm of the powder, from one to two fluidounces of the officinal decoction, or one or two fluidrachms of a saturated tincture, should be given three or four times a day, and continued for several weeks; the dose being gradually increased until it produces some sensible effect, as nausea, headache, vertigo, or disordered vision. It is important that the root should be of good quality, which is to be judged of by its properties of smell and taste. The fresher it can be obtained the better.

In addition to these measures, the cold or shower bath will sometimes produce the happiest effects; and sea-bathing is a highly valuable remedy. The cold bath should be employed only when followed by reaction. In Russia, the practice has been adopted of first placing the patient for half an hour in a bath as hot as he can bear it, and then, after he has been thrown into a profuse perspiration, of plunging him suddenly into cold water. The sulphur bath has been used with great asserted advantage in France. In obstinate cases it should be tried. Fresh pure air, and moderate exercise are very useful, especially towards completing a cure. All these advantages, as well as that of pleasing occupation of the attention, may be gained by a visit during summer to the sea-shore, or some one of the sulphur springs; and this measure should be resorted to after others have failed, or to confirm convalescence in those whose general health may be delicate, and constitutional tendency to the disease strong. To maintain the mind in a cheerful state, and the temper free from excitement, are points of some importance in the treatment of chorea. A well-arranged course of gymnastic exercises would probably be very useful. In relation to the diet, the only general rule is that it should be accommodated to the state of the system. If this be full and excited, a vegetable or milk diet would be advisable; but in general the patient may be permitted to use ordinary food, taking care to avoid indigestible and acescent substances. The habitual use of tea and coffee should be abandoned; and temperance in all things observed.

Besides the above remedies, many others have been employed in chorea, and most of them with more or less apparent benefit.

The narcotics have been recommended; and belladonna, stramonium, hyoscyamus, and hydrocyanic acid have been chiefly employed. Friction with chloroform has been resorted to; and, in some very severe cases, relief has been afforded by the same remedy inhaled; but the danger of fatal results in this mode of administering it, should I think preclude its use in all ordinary cases. Opium also has had its advocates. These medicines may be occasionally added with advantage to those above mentioned, when particularly called for by neuralgic pains or wakefulness. Opium is frequently useful in counteracting the effect of the irritant metallic tonics upon the stomach and bowels. Dr. Storer, of Boston, employed tincture of hemp (cannabis Indica) successfully, after failing with carbonate of iron. (*Boston Med. and Surg. Journ.*, liii. 209.) The calabar-bean has been given by Dr. Ogle with decided success. Of a tincture made with a drachm of the bean and an ounce of rectified spirit, he gave at first half a drachm three times a day, in water, and increased the dose by ten drops, until, in one instance, it reached forty drops, and in another a drachm three times daily. (*Med. T. and Gaz.*, Jan. 1866, p. 36.) Sulphate of anilin has been given by Dr. Fraser with favourable results in two cases of the disease, though he had previously administered it without any advantage whatever in several other cases, which afterward got well under arsenic. The dose, which was at first the fraction of a grain, was increased to six or seven grains three times a day. It caused a mauve colour of the lips, and is said to have produced headache in most of the cases. (*Ibid.*, March, 1862, p. 239, and Aug. 1865, p. 141.)

Emetics occasionally repeated, tartar emetic in large doses upon the contra-stimulant plan, Fowler's solution or other preparation of arsenic, the preparations of iodine, oil of turpentine, chenopodium ambrosioides, cardamine pratensis, artemisia vulgaris, orange leaves, gymnastic exercises in connection with the sulphur bath, electricity or galvanism, and antimonial pustulation over the shaved scalp, are remedies in favour of which respectable authority might be cited. They may be tried when other methods have proved abortive. Dr. Jackson, of Boston, considers oil of turpentine as the most effectual remedy. Mr. Monahan, of Dublin, has cured a case by the application of splints. (*Dub. Hosp. Gaz.*, Feb. 15, 1857, p. 55.)

Dr. Bardsley, of Manchester, England, tried a great number of distinct remedies, and different plans, in the treatment of chorea, and came at last to the conclusion, that purgatives followed by antispasmodics were the most effectual. He gave purgatives until the discharges became healthy, and then administered musk and camphor, in the dose of four grains of each every four or five hours, with an enema of assafetida or a little laudanum at bedtime.

SUBSECTION II.

DISEASES OF THE SPINAL MARROW.

A STRONG analogy exists between the spinal marrow and the brain, in their pathological relations. There is in both the same liability to inflammation of the membranes and the nervous matter, to derangement from non-inflammatory organic affections, including hemorrhagic and serous effusion, and to various functional disorder; and these different affections in the one are not unfrequently merely extensions of the same affections in the other. Like the brain, too, the spinal marrow contains at once nervous centres and conducting filaments, and may suffer disease in these constituents separately or conjointly.

It is a fact which must always be borne in mind, in estimating the diseases of the cord, that it has a double office; *first*, that of receiving impressions from other parts of the body and of transmitting influence to those parts, which it may do independently of the brain; and *secondly*, that of conveying influence to and from the brain. By the former office it regulates, conjointly with the ganglia, most of the organic functions so far as nervous influence is concerned; by the latter, it is necessary to sensation and voluntary motion over the greater portion of the body. Two sets of phenomena, therefore, are consequent upon disease of the cord. In the first place, we have, as the result of a perversion of its direct original action, symptoms of disorder in the digestive, respiratory, circulatory, nutritive, secretory, and reproductive functions, all of which are more or less under the control of the spinal centres; and, in the second place, those indicative of interrupted or deranged cerebral influence, such as perverted, deficient, or abolished sensation, and in various degrees the loss of the power of voluntary motion. Involuntary or spasmodic muscular contractions may arise either from disorder of the reflex spinal function seated in the centres, or from disease of the conducting filaments.

As different parts of the spinal marrow preside over different functions, and the nerves which convey influence to and from the brain leave the cord in different parts of its course, it follows that the morbid phenomena must vary with the portion of the cord affected. So far as the several spinal centres are concerned, the expression of their disease will be confined chiefly to the organ or function over which they preside; but it is obvious that, in relation to cerebral influence, if interrupted by disease of the conducting portion of the spinal marrow, it must be so for all parts supplied with nerves below the seat of disease, while those above may be unaffected. Thus, disease of the cervical portion of the cord will affect speech, deglutition, respiration, and all the organic functions in the neck and upper extremities; while sensation and voluntary motion may be deranged in all parts of the body supplied with spinal nerves. Disease in the upper dorsal portion affects especially the digestive function, more or less also respiration and circulation; while paralytic symptoms are confined to the trunk and lower extremities. The lower dorsal and lumbar portion may involve in their disorder the bowels, and the urinary and genital apparatus, and produce palsy in the lower extremities, without affecting the chest and arms.

In the following articles, the diseases of the spinal marrow are treated of under the several heads of 1. inflammation, 2. organic affections not necessarily inflammatory, and 3. functional disorder.

Article I.

INFLAMMATION OF THE SPINAL MARROW AND ITS MEMBRANES.

There is in the spinal marrow the same difficulty as in the brain in distinguishing between inflammation of the membranes and that of the nervous matter. The fact is, that they are generally in a greater or less degree associated; and probably almost always so, when they occupy any considerable portion of the cord. Nevertheless, they appear sometimes to be distinct; and, even when connected, often exhibit phenomena which indicate that one of these structures is more prominently affected than the other. It is not improper, therefore, to treat of them distinctly; and I shall do so, under the names of *spinal meningitis* and *myelitis;* though it is important that the reader should be aware that, in neither case, is the name exclusive; the former term admitting the idea of attendant inflammation of the nervous matter, and the latter, that of the meninges.

1. Spinal Meningitis.—This is inflammation of the membranes of the spinal marrow, with or without inflammation of the medullary substance. The membranes are primarily and chiefly affected; and it is probable that the grade of action in the medullary matter often scarcely exceeds the point of high vascular irritation; at least not to any considerable depth.

The student will recollect that the membranes of the spinal cord are the same as those of the brain, with which they are continuous; the pia mater immediately enveloping the proper cord, the dura mater lining the bony canal, and the arachnoid lying between them, and giving a coating to both. The arachnoid cavity of the spine is continuous with that of the brain.

Of the membranes, the dura mater is sometimes chiefly affected, but very seldom exclusively. The arachnoid, from its want of vascularity, scarcely appears to suffer. The pia mater is almost always the prominent seat of the inflammation.

It is chiefly through irritation of the nervous matter, either of the cord, or of the nerves passing out from it, that the disease makes itself known; almost all its peculiar symptoms being such as result from disturbance of the spinal functions.

Special meningitis may be acute or chronic, and may exist separately, or in connection with cerebral meningitis. In its highly acute forms it is very often thus complicated. It will be most conveniently considered, in relation to the symptoms, in the three divisions of the acute, cerebro-spinal, and chronic.

Acute Spinal Meningitis.—This is sometimes preceded by soreness or dull pains in the back, and feelings of weakness, heaviness, or other uneasiness in the extremities; but not unfrequently it begins abruptly with severe pain in the spine, either confined to one part of the column, or beginning in one part, and extending through a greater or less portion of its length. The cervical portion is said to be attacked more frequently than the dorsal or lumbar. The pain is much increased by motion; and is very often attended with a feeling of constriction around the body, either in the chest or abdomen, according to the precise seat of the inflammation. This, indeed, is one of the most striking characteristics of spinal inflammation of whatever kind. The pain which attends any voluntary attempt at motion is often so great as to induce a quiescence of the limbs which might be mistaken for palsy, but is wholly distinct from that affection. Pressure upon the vertebræ produces comparatively little increase of the pain, unless the spinal ligaments are involved.

Nor is the pain confined to the seat of the disease, or its immediate vicinity. In all parts of the body supplied with nerves from the affected part of the spine, there are uneasy sensations of various kinds, sometimes acute neuralgic pains, but more frequently tingling, formication, or numbness, especially in the extremities. Cutaneous sensibility is sometimes excessive. Abdominal pains are not unfrequent, particularly in the hypochondria and epigastrium.

Another very frequent and characteristic phenomenon is spasmodic rigidity of the muscles, more particularly of those lying along the spine. The head is drawn firmly backward, and long kept in that position; and sometimes the whole trunk is stiffly bent in the same direction, constituting complete opisthotonos. Spasmodic closure of the jaws, and cramps of the extremities are not uncommon. Clonic spasms are also experienced, amounting in some cases almost to convulsions, in others, only to twitching of the tendons. Occasionally sensations like electric shocks are felt, arising from irritation of the motor nerves. General convulsions are rare unless the brain is involved.

The limbs are enfeebled; but the power of voluntary motion is seldom entirely lost, at least in the earlier stages.

The attack is accompanied with febrile symptoms. The pulse is usually frequent, full, hard, and regular; and, if small, weak, soft, and irregular, there is reason to think the medullary substance may be involved. The impulse of the heart is strong; the skin is hot and often perspiring, sometimes profusely so; the respiration is laborious, hurried or slow, and almost always restricted; anorexia and constipation are ordinary symptoms; and retention of urine is very apt to occur, requiring the use of the catheter.

The portion of the spine diseased has great effect in modifying the symptoms. If the inflammation is seated very high in the column, affecting even the medulla oblongata, there may be headache, contraction or dilatation of the pupils, photophobia sometimes very severe and painful, hallucinations of hearing, even delirium, coma, and facial paralysis. There may also be signs of irritation of the vagus, as palpitation, aphasia, hurried breathing, stertor, &c. Somewhat lower down, it may cause difficulty of speech and deglutition, trismus, cardiac disturbance, and even hydrophobic phenomena. If in the dorsal part of the column, acute disorders of the lungs, heart, and stomach may be induced; and careful physical examination might be necessary to determine how far these organs are involved. Among the symptoms may be pectoral pains, cough, dyspnœa, precordial anxiety, palpitation, vomiting, &c.

The symptoms occasionally remit considerably, as in cerebral meningitis, and are said even to intermit, but afterwards to return with increased violence. The inflammation may end quickly in resolution, in which case there is usually copious diaphoresis, or a large uric acid deposit in the urine. Sometimes the convalescence is slower, and attended with constipation, hemorrhoids, incontinence of feces or urine, and continued weakness of the extremities; but these symptoms gradually disappear, and the patient recovers. In other instances, the disease assumes the chronic form. When curative measures fail, the pulse becomes irregular, small, and feeble; symptoms of drowsiness, perhaps of delirium occur, ending finally in coma; sometimes paralysis of the extremities may be observed; involuntary evacuations take place from the rectum and bladder; and the patient dies, at a period varying from four or five days to two weeks from the commencement of the attack.

When the spinal canal is opened after death, the cord usually appears swollen; but this is owing to thickening or effusion in the membranes; and not to increased bulk of the medulla itself, which may even be compressed. The dura mater is deeper coloured than usual in health; the arachnoid exhibits little change, unless that it may be more or less opaque; the pia mater is reddened, injected, and swollen; and these phenomena are observed more especially on the posterior face of the cord. A turbid serum is often seen, especially in the lower part of the spinal canal, where it is carried by gravitation.

Coagulable lymph and pus are found between the arachnoid and pia mater, spread over the surface of the membranes. The medullary substance may be somewhat injected, but is rarely softened, unless in the cases attended with paralysis.

Cerebro-spinal Meningitis.—This form of the disease most commonly occurs epidemically, and in connection with a malignant form of fever, which has been fully treated of, in the present edition of this work, under the head of *petechial fever*, to which the reader is referred (vol. i. p. 413). It does, however, sometimes occur distinctly; and is characterized, when fully formed, by headache more or less severe, increased sensitiveness to light and sound, delirium, convulsions; and, along with these cerebral symptoms, others indicating the spinal disease, such as already described under simple spinal meningitis, among the most striking of which are the rigid spasms or cramps, drawing the head stiffly backward, and sometimes rendering the whole body almost as rigid as a board. These phenomena are attended with fever; and, should a favourable change not take place, are followed by comatose and paralytic symptoms, and soon afterwards by death. The appearances after death are those already detailed under cerebral and spinal meningitis.

Chronic Spinal Meningitis.—This is much less frequent than the acute, unless as a consequence of organic disease of the cord, or the vertebræ. It comes on with dull pains in some portion of the spinal column, with deranged sensations in the extremities, such as formication, tingling, &c., and disorder in the functions of the thoracic, abdominal, or pelvic viscera. The characteristic rigid or tonic spasms take place after a time; the limbs become contracted, the head is sometimes drawn to one side, or permanently backward, and even the trunk distorted. The patient often suffers much from acute pains in the limbs, abdomen, &c. An acute attack sometimes supervenes, and proves speedily fatal; or death takes place from the consequences of paralysis, exhaustion, or a gradual failure of the vital functions, after many months or years of suffering. There is reason, however, to believe that recovery often takes place under judicious treatment.

2. **Myelitis** (from μυελός, marrow) is here employed to signify inflammation of the substance of the cord. Like spinal meningitis, it may be acute or chronic. In very acute cases, there is much spinal pain, which is greatly increased by motion and pressure; and convulsions sometimes attend the early stage. Pains too are experienced in various parts of the body, supplied with nerves from the affected portion of the cord. Formication, tingling, numbness, and a feeling of coldness in the limbs are ordinary sensations. These may occur in a single limb, in both of the lower extremities, or in one-half of the body. Along with deranged sensation there is also diminished power of the muscles, which is at first indicated by uncertainty of movement, and ends, if the case advance, in complete paralysis. Upon the occurrence of this affection, the pains generally cease. Sometimes the paralysis begins at the remotest part of the extremities, and gradually ascends until it involves the vital organs. Not unfrequently involuntary contractions of the muscles, either rigid or clonic, accompany this loss of voluntary motion. Sensation may continue, or be abolished. The continuance of sensation, when motion is lost, is explained by the different origin of the nerves of these functions. When there is paralysis of motion alone, the anterior nerves only are affected; when both functions are paralyzed, the disease has seized upon both sets of nerves.

It was supposed that disease of the anterior and posterior spinal columns might have differences of effect, corresponding with the nerves proceeding from them respectively; and a case of paralysis, as detailed by Abercrombie, in which the sensibility of the limbs continued unimpaired, and after death the anterior fasciculi of the dorsal portion of the cord were found diffluent, while the posterior retained their consistence, gave some countenance to the supposition.

But another case was recorded by Mr. Stanley, in w
condition of the limbs, during life, was found, after d
with softening of the posterior column exclusively. (W
ed., p. 296.) This apparent anomaly may be explain
that the conducting fibres cross each other before lea

The paralysis extends to the bowels, producing ob
to the bladder, causing retention of urine; but ultim
coming involved, these conditions are followed by inc

At the same time that the muscles thus lose their
tions are deranged. The stomach, the liver, the kid
are liable to various disorder. Palpitations, dyspnœ
unfrequent attendants on the disease.

Febrile symptoms are not usually developed in any c
pulse is seldom much accelerated, and is often slower
spiration is also slow and confined.

Death sometimes takes place very speedily, even d
day. The cause may be readily understood, when the a
above the point at which the respiratory nerves pas
cease, if the spinal marrow above this point become
influence from the respiratory centre. In the lower p
amount of disease would be longer in producing deat
immediately essential to life are not interrupted.

When the case is at all protracted, eschars are apt t
hips, in consequence of pressure; and the fatal issue is
ing discharges which take place. There is no fixed per
tion of the disease. Though, as already stated, it ma
in less than forty-eight hours; yet, much more frequen
or ten days, or longer; and its term may vary, accordi
ness or chronicity, from the period mentioned to wee

The *chronic* form of the disease, which is more
commences almost insensibly, with a little uneasiness
ordered sensations in the extremities, and unusual fa
little apprehension is felt, until, at length, paralytic s
perienced. These slowly increase. The patient may
which are sometimes almost constant. The gait be
ting, tottering. The limbs no longer support the b
croaches upon the trunk, affects the urinary organs, a
chest. Involuntary startings of the muscles, and some
mingle with the advancing paralysis. Sloughs and
discharges, form upon the sacrum, hips, &c., and the
over his evacuations. The pulse is usually slow and
and the limbs frequently edematous. Death takes p

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* Other cases of a similar kind have since been noticed, in
of the posterior spinal column took place, without loss of s
(Friedreich, *Arch. Gén.*, Mars, 1864, p. 316.) I leave the re
tion as originally made in the text, before those highly imp
Séquard were made known, which have demonstrated, I thin
that the nerves of sensation, very soon after entering the sp
side; so that, while the decussation of the fibres conveying t
within the cranium, that of the sensory fibres occurs in th
important fact, recently demonstrated, is that the posterior c
riers of sensitive impressions to the brain; their function be
concerned with the co-ordination of voluntary motions. Hen
that, in a case of complete destruction of the posterior fasc
bility of the limbs should remain wholly unimpaired. It is
that it is the gray portion of the cord that conveys sensation
of this remains to form a continuous connection between the
centres sensation is not lost. (*Note to the sixth edition.*)

haustion, and sometimes of asphyxia, the paralysis rising gradually until it involves the chest.

The chief anatomical character of myelitis is softening of the medulla. This exists in various degrees, from a slight diminution of consistence to complete diffluence. Sometimes the colour of the softened part has some shade of red, but more frequently it is yellowish, or of the natural whiteness. The softness may occupy a portion only of the diameter of the cord, passing upward and downward in the direction of the column, or may involve its whole thickness. Doubts have been entertained whether the yellow and white softenings are really the result of inflammation. They are attended with the same symptoms during life. Signs of meningitis are often observed in connection with the myelitis, but not always. When, notwithstanding a complete destruction of the cord at a certain part, pains and other abnormal sensations have been seemingly felt in the lower extremities, or other parts supplied with nerve influence from below the injured point, the result may be ascribed to irritation of the cerebral extremity of the cord; the sensations being referred by the brain to the parts where the nerves are distributed, which had been previously connected with the irritated tissue.

Diagnosis.—It has been suggested that meningeal inflammation might be recognized by the existence of tonic spasms or rigidity; but these happen also in pure myelitis, though less frequent or striking. Paralysis may generally be considered as an evidence of the latter complaint, when attended with other marks of inflammation in the spinal column. It is, however, of little consequence to distinguish the two affections, as their treatment is essentially the same. It is more important not to mistake spinal inflammation, whether meningeal or medullary, for rheumatism of the spinal ligaments, or of the neighbouring muscles. Cases of the former diseases have often been fatally neglected, under the impression that they belonged to the latter. It is only in the early stages that there can be any danger of such a mistake. The occurrence of tonic spasms, or of paralytic symptoms, would sufficiently distinguish the spinal inflammation. When these are absent, a just inference can sometimes be drawn from pressure, which, in spinal inflammation, will occasion most uneasiness when made upon the spinous processes, in muscular rheumatism, when made alongside of the spine. In this variety of rheumatism, moreover, the pain on motion is generally very obviously dependent on the contraction of the muscles. In cases of rheumatism affecting the ligamentous structure, these latter symptoms could not be depended on as diagnostic. In such cases, however, the constitutional symptoms would be less severe than in inflammation of the cord, the pain would be less, except on movement, and the previous or contemporaneous existence of rheumatism elsewhere would be almost decisive. There may be some danger of confounding inflammation of the spinal marrow, or its membranes, with spinal irritation; but the reader is referred to the latter affection for the diagnostic symptoms.

Causes.—Among the most common causes of spinal inflammation are falls, blows, great and frequent straining, and fatiguing muscular exertion of all kinds. Abuse of the venereal propensity is also said to produce it, especially that form of it attended with softening. Vicissitudes of weather, alcoholic drinks, and other ordinary sources of inflammation occasionally act as causes. It is probable that rheumatism, in its inflammatory form, sometimes seizes on the cord, and especially on the membranes. The disease has been ascribed, as other internal inflammations, to the suppression of normal or pathological discharges, and the disappearance of cutaneous eruptions. Occasionally it appears to result from epidemic influence. Other diseases of the spine occasion it, such as caries, tubercles, &c. It is very apt to be propagated from inflammation of the corresponding tissue in the brain. Tuberculous spinal meningitis almost always has its origin in this source. Age has apparently some influ-

But another case was recorded by Mr. Stanley, in which a precisely similar condition of the limbs, during life, was found, after death, to be accompanied with softening of the posterior column exclusively. (*Watson's Lectures*, 2d Am. ed., p. 296.) This apparent anomaly may be explained, upon the supposition that the conducting fibres cross each other before leaving the spinal column.*

The paralysis extends to the bowels, producing obstinate constipation, and to the bladder, causing retention of urine; but ultimately, the sphincters becoming involved, these conditions are followed by incontinence.

At the same time that the muscles thus lose their power, the organic functions are deranged. The stomach, the liver, the kidneys, the genital organs, are liable to various disorder. Palpitations, dyspnœa, and hiccough are not unfrequent attendants on the disease.

Febrile symptoms are not usually developed in any considerable degree. The pulse is seldom much accelerated, and is often slower than in health. The respiration is also slow and confined.

Death sometimes takes place very speedily, even during the first or second day. The cause may be readily understood, when the affection occupies the cord above the point at which the respiratory nerves pass off. Respiration must cease, if the spinal marrow above this point become incapable of conveying influence from the respiratory centre. In the lower part of the spine, an equal amount of disease would be longer in producing death, because the functions immediately essential to life are not interrupted.

When the case is at all protracted, eschars are apt to form upon the back and hips, in consequence of pressure; and the fatal issue is hastened by the exhausting discharges which take place. There is no fixed period for the fatal termination of the disease. Though, as already stated, it may, in the acute form, end in less than forty-eight hours; yet, much more frequently, it runs on for a week or ten days, or longer; and its term may vary, according to its degree of acuteness or chronicity, from the period mentioned to weeks, months, or years.

The *chronic* form of the disease, which is more frequent than the acute, commences almost insensibly, with a little uneasiness in the spine, slightly disordered sensations in the extremities, and unusual fatigue after exertion; but little apprehension is felt, until, at length, paralytic symptoms begin to be experienced. These slowly increase. The patient may be affected with tremors, which are sometimes almost constant. The gait becomes uncertain, vacillating, tottering. The limbs no longer support the body. The paralysis encroaches upon the trunk, affects the urinary organs, and ascends at last to the chest. Involuntary startings of the muscles, and sometimes rigid contractions mingle with the advancing paralysis. Sloughs and ulcers, with exhausting discharges, form upon the sacrum, hips, &c., and the patient loses all power over his evacuations. The pulse is usually slow and feeble, the surface pale, and the limbs frequently edematous. Death takes place as the result of exhaustion, and sometimes of asphyxia, the paralysis rising gradually until it involves the chest.

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* Other cases of a similar kind have since been noticed, in which complete destruction of the posterior spinal column took place, without loss of sensation in the extremities. (Friedreich, *Arch. Gén.*, Mars, 1864, p. 316.) I leave the remark in relation to decussation as originally made in the text, before those highly important researches of Brown-Séquard were made known, which have demonstrated, I think beyond reasonable doubt, that the nerves of sensation, very soon after entering the spinal cord, pass to the other side; so that, while the decussation of the fibres conveying the motor-power takes place within the cranium, that of the sensory fibres occurs in the spinal marrow. Another important fact, recently demonstrated, is that the posterior columns are in no degree carriers of sensitive impressions to the brain; their function being supposed by some to be concerned with the co-ordination of voluntary motions. Hence it is by no means singular that, in a case of complete destruction of the posterior fasciculi of the cord, the sensibility of the limbs should remain wholly unimpaired. It is now pretty well determined that it is the gray portion of the cord that conveys sensation; for so long as any portion of this remains to form a continuous connection between the periphery and the cerebral centres sensation is not lost. (*Note to the sixth edition.*)

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Prognosis.—The severe forms of spinal and cerebro-spinal inflammation are very dangerous, though not so necessarily fatal as some writers appear to believe. Cures of this, as of cerebral meningitis, may be effected in many cases by prompt and energetic treatment. In some instances, it is true, especially in the epidemic form, the death-blow seems to be given at the very commencement. Very discouraging opinions are also given of the prognosis in myelitis. After it has advanced to confirmed paralysis, there may not be much to hope for; but I am convinced that, in its early stages, it is often set aside by judicious remedies. In no case should the practitioner despair, unless when the powers of life are obviously giving way, when the patient loses command of the sphincters, and a tendency to sloughing is evinced.

Treatment.—The treatment of spinal inflammation is to be conducted upon the same plan as that of inflammation elsewhere. In the acute affection, bleeding as freely and as frequently as the pulse and general strength will permit; copious and repeated local depletion by cups and leeches along the spine, with emollient lukewarm cataplasms in the intervals; purging with calomel in the beginning, and subsequently with the saline cathartics, but never violently; and, lastly, should the disease not yield to depletion, blisters over the whole length of the inflamed portion, with the use of mercury in reference to its constitutional impression, constitute the sum of the treatment. Some recommend cold to the spine, as to the head in cerebral inflammation. Refrigerant diaphoretics and cooling drinks may be given during the existence of febrile symptoms. Measures may also be used to act revulsively on the spinal affection, by sustaining an irritative impression on the extremities, or otherwise retaining an excess of blood in those parts. Perfect rest should be enjoined; and the patient should never be permitted to rise even for the purpose of a stool. The diet, of course, must be rigidly antiphlogistic. Care should be taken to prevent undue accumulation of urine, and for this purpose recourse should be had, if necessary, to the catheter.

The chronic affection is to be treated upon the same principles precisely, but less energetically. Repeated leeching and cupping will here be preferable to general bleeding. A constant succession of blisters must be maintained; or their place supplied by issues, setons, copious antimonial pustulation, or moxa. Some writers strongly recommend the actual cautery. Much may be expected from a moderate and long-sustained mercurial impression; but it is very desirable so to manage the remedy as scarcely to produce any effect upon the mouth. One of the most important measures is absolute rest in bed. For the treatment of any paralytic affection, which may remain after the subsidence of the inflammation, the reader is referred to paralysis. The disposition to slough should be guarded against, as far as possible, by means of alcoholic lotions, the lead plaster, hollow cushions, down pillows, occasional change of position; and, when ulcers have formed, they should be dressed frequently and carefully, so as to preserve cleanliness; and fetor should be corrected by creasotic or chlorine washes.

Article II.

ORGANIC DISEASES OF THE SPINAL MARROW.

ALLUSION is here had to affections not essentially inflammatory in their character. As they all produce certain common effects, they may be most conveniently considered under one head. These effects, so far as the symptoms are concerned, resolve themselves into those of pressure upon the cord, and of irritation, inflammation, or disorganization of its substance.

Symptoms.—Pain of various degree and character is felt in the spine; moderate or severe, dull or acute, burning, gnawing, lancinating, heavy, pulsative, &c. There are also morbid sensations of different kinds in those portions of the body supplied with nervous influence from the part affected. Feelings of tingling, pricking, or formication, of numbness and coldness, and frequently of acute pain, sometimes stationary, sometimes shooting along the course of the nerves, are experienced in the limbs and different parts of the trunk and neck. Uneasy sensations of almost infinite diversity are felt in the chest, abdomen, or pelvis, according to the situation of the spinal affection; and among these sensations sharp or neuralgic pains are not unfrequent. A sense of stricture, as of a band about the body, is very common.

Superadded to deranged sensation, there is a gradually increasing weakness of the muscles, which at length ends in palsy, sometimes both of sense and motion, sometimes of the latter exclusively; and the paralytic affection may be confined to one limb or one side, may extend to several limbs, or may embrace almost the whole body. Paraplegia is among the most common results. Constipation and retention of urine, or the contrary condition of incontinence, are apt to occur, consequent on paralysis of the rectum and bladder in the former case, and of the sphincters in the latter. The palsied limbs undergo atrophy, and often become the seat of serous effusion.

Involuntary muscular contractions very often accompany the loss of voluntary power, and either tetanic rigidity, or clonic spasms, are experienced in different parts of the body. The digestion, respiration, and circulation undergo various disorder. Vomiting, dyspnœa, and palpitation are not unfrequent. When the disease is near the foramen magnum, deglutition is difficult, and respiration especially disturbed. The brain sometimes becomes involved directly or sympathetically; and headache, delirium, convulsions, strabismus, stupor, coma, &c. are added to the other symptoms. Finally, sloughs upon the surface result from pressure, and are followed by exhausting ulcers. Death takes place either from pure exhaustion, or from interruption of one of the vital functions. The disease may be a few months, or many years, in completing its course.

Of the affections alluded to, most are inevitably fatal. But I rank under the same head effusion into the spinal canal, when sufficient to give rise to the above phenomena, or most of them; and this may end favourably. The following is a brief enumeration of the several affections.

Hemorrhage.—Blood may be effused without the dura mater, in the cavity of the arachnoid, between that and the pia mater, or in the substance of the marrow. It is very generally consequent upon active congestion, and therefore often associated with signs of inflammation; nor are we in possession of any means of forming an accurate diagnosis. But, when the symptoms of compression of the spinal marrow come on suddenly, we may suspect the existence of hemorrhage. The first symptoms of spinal hemorrhage are said to be general chilliness, and pain along the spine at the seat of the effusion, increased by pressure on the spinous processes. These are soon followed by paralysis, affecting either one or both sides of the body, or especially the side corresponding with the hemorrhage. As the blood sometimes travels from one part to another, the symptoms may be expected to change their seat. When effused around the cord, it may produce only a moderate degree of numbness or muscular weakness; when into its substance, it generally gives rise to complete paralysis. Either death may ensue, or the blood may become encysted and absorbed, as in the brain. When there is reason to suspect the existence of hemorrhage, the remedies indicated are perfect rest, cold applications to be confined to one or a very few of the vertebræ; and, not unfrequently, one is more acutely sensitive, while above and below it the tenderness gradually diminishes until it ceases to be evident. The dorsal vertebræ are most frequently affected. There is not less difference in the degree of tenderness than in its precise seat. In some instances it is slight, requiring rather heavy pressure to develope it; in others it is exquisitely keen, so that a touch produces uneasiness, and the slightest pressure occasions intolerable pain. I have repeatedly known patients to start as if struck with a pistol ball, or pierced with a knife, upon gentle pressure being made with the finger on one of the spinous processes; and, even in a state of apparent coma, with all other parts of the body insensible to painful impressions, the most marked evidence of suffering will be presented by the face of the patient, and the movements of the body, when the tender vertebra is touched. The pain is often described as shooting through the body anteriorly, and is not unfrequently attended with sensations of nausea, or sickening faintness. A remarkable circumstance is, that, in the greater number of cases, there is little or no pain in the affected portion of the spine except when pressure is made, so that the real seat of disease might escape notice, were not the attention of the physician directed towards it by symptoms existing elsewhere.

I shall not pretend to enumerate all these symptoms; but shall content myself with calling attention to some of the more prominent. They vary with the portion of the spine affected; those parts especially showing signs of disorder, which receive nerves directly or indirectly from the vicinity of the tender vertebræ. But it will be more convenient to consider them in relation to the functions than the particular structures. Beginning with the digestive function, we have difficult deglutition, stricture of the œsophagus, gastrodynia, spasm of the stomach, excessive thirst, morbid appetite or anorexia, nausea and vomiting, and various most distressing and indescribable sensations in the epigastrium, such as attend the worst cases of dyspepsia. Some of the most obstinate instances of vomiting that I have witnessed appeared to be dependent on this cause. In the bowels, there are neuralgic and colicky pains, flatulence, and the most diversified uneasiness.

The respiratory organs are also liable to be attacked. The voice is sometimes altered; violent cough from laryngeal irritation is not uncommon, and alarming spasm of the glottis occasionally has a similar origin. The dyspnœa which attends the disease is sometimes very distressing, scarcely falling short of a violent paroxysm of asthma. Dr. S. C. Thornton, of Moorestown, N J., has described a curious case of spasmodic contractions of the diaphragm from this cause, coming on paroxysmally every six or eight months, and continuing for two or three weeks. The spasms occur at regular intervals of about ten seconds, and persist for the whole period mentioned, producing great jarring, soreness, and distress, and preventing sleep. (*Med. and Surg. Reporter*, xi. 93.)

Palpitations of the heart are very frequent, and other signs of functional cardiac disorder are occasionally offered, such as faintness or syncope, and pains resembling those of angina pectoris.

Deranged hepatic secretion, uneasy sensations in the liver, various urinary disorder, tenesmus, and derangements of the sexual functions, especially amenorrhœa, are not uncommon.

Neuralgic pains are experienced in the muscles of the chest, extremities, shoulders, neck, and occiput. Pains, too, resembling those of rheumatism, are felt in various parts of the body. Other kinds of uneasiness, such as tingling, formication, pricking, intense itching, burning, numbness, coldness, and diversified anomalous sensations, occur in the limbs and trunk. Cramps, convulsive movements, and paralytic symptoms in various parts of the body may be added to the list. I have repeatedly witnessed comatose symptoms apparently dependent on the same cause. These may arise from excessive sympathetic irritation of the cerebral centres, suppressing function; or from a contraction of the cerebral capillaries, consequent upon irritation of the sympathetic nerve centres within the spinal column.

In short, there is scarcely a morbid sensation or perversion of function, occurring in any part of the body beneath the head, which may not originate in spinal irritation; and, whenever the cause of any existing disorder of this kind is obscure, it should be sought for in the spine.

The affection often attends other diseases. It is very common in hysteria, so much so as to be almost characteristic of the complaint. It is also occasionally observed in chorea and epilepsy. There is reason to believe that cases resembling tetanus and hydrophobia, and which have been mistaken for these complaints, have depended upon this kind of spinal irritation.

Causes.—These are not well understood. The disease occurs most frequently in women, and especially during the menstruating period, or between the ages of fourteen and forty-five. It would seem, therefore, to have some connection with the uterus; but such a connection is certainly not essential, for the disease often occurs in children, and sometimes in men. Spinal distortion seems also to constitute a predisposition. Of the exciting causes, the changes in the weather are probably among the most frequent. Mental disturbance appears to be capable of inducing it, and perhaps any other cause calculated strongly to impress the nervous system.

Nature.—Some difference of opinion has existed on this point. While the affection is generally considered as residing in the spinal cord, some have been unable to conceive that the extreme tenderness evinced in many cases could depend upon the cord itself, enclosed as it is within a firm bony case, and not even in close contact with that. The most rational view of the affection appears to be, that it is seated essentially in the ligaments of the vertebræ, and is generally of a rheumatic or gouty character. It is readily conceivable that irritation may be propagated from this structure to the nervous tissue of the cord, or at least to the nerves which proceed from the cord, and receive as they pass an envelope probably of the diseased tissue. The character of the affection in the ligaments may be inferred to be that of subacute rheumatic inflammation, and not merely neuralgic, from the circumstance that it yields often with so much facility to local depletion.

Diagnosis.—The affection which this most resembles is inflammation of the spinal cord. It is distinguished by the absence of fever, the greater tenderness upon slight pressure, with the comparative want of pain under other circumstances, the ability to move with little or no uneasiness, and the more shifting character of the complaint. The facility with which it is generally relieved is another diagnostic sign.

Prognosis.—This is almost always favourable, at least in relation to any one attack. But there is in some a strong tendency towards it, so that, though relieved for a time, it often recurs; and this tendency may persist for many years. It disappears, however, usually in advanced life. The disposition to frequent return is another point of resemblance with rheumatism. When the affection is neglected, it may, probably, sometimes occasion serious organic disease in the parts at first only functionally disturbed.

Treatment.—This must be directed chiefly to the spinal affection. A few cups or leeches applied to the tender spot, or its immediate vicinity, will often afford complete relief. Should one application of the remedy not answer, it may be repeated again and again. After sufficient depletion in this way, a blister may be created immediately over the tender vertebræ, and renewed as it heals. Should the disease be obstinate, pustulation with croton oil or tartar emetic may be resorted to. The latter is the most effectual. Advantage will sometimes accrue from sulphate of morphia sprinkled upon the blistered surface; and the subcutaneous injection of a solution of this, or of other salt of morphia, will often afford complete relief. Sometimes the rubefacients will answer instead of blistering or pustulation. Mustard, or solution of ammonia, more or less diluted, should be preferred.

Sometimes, when the tendency to the affection is strong, it is necessary to sustain the antimonial pustulation for several months before it can be eradicated. Issues may be preferred in some of these cases.

The constitutional treatment must be accommodated to the circumstances of the case. The bowels should be kept regular, hepatic or urinary disorder should be corrected, the menses, if retained or suppressed, should be restored, and anæmia treated in the usual manner. The neuralgic pains occurring in different parts of the body sometimes require attention; and any existing rheumatic or gouty tendency should be obviated. To treat of the means requisite for these various ends would be merely to repeat what has been detailed elsewhere. It not unfrequently happens that spinal tenderness, in women, is associated with retroversion or other abnormal position of the uterus, and yields to measures calculated to obviate this condition of things.

Article IV.

TETANUS.

Syn.—*Locked Jaw.*

TETANUS (from τείνω, I stretch) is a disease in which the muscles are in a state of rigid lasting contraction, with paroxysms of brief and painful spasm, alternating with irregular intervals of more or less complete relaxation, without coma, or any essential disturbance of the mental faculties.

Different names have been conferred upon the tetanic condition, according to the obvious effects of the spasm. Thus, when it produces a closure of the jaws, the affection has been denominated *trismus;* when a curvature of the body backward, *opisthotonos;* when forward, *emprosthotonos;* when to one side, *pleurosthotonos.* These conditions are now treated as mere symptomatic diversities of the same disease.

Tetanus has been divided into the *idiopathic* and *symptomatic;* the former, independent of any other known pathological condition; the latter, produced by some other distinct affection existing within or without the spine. The symptomatic variety, when originating in wounds or other external injury, is called *traumatic tetanus.* This latter name, as embracing cases of very frequent occurrence, of a certain identity of origin, and peculiar violence of character, is very convenient, and almost universally employed. As, in relation to the disease from other sources, there is always much uncertainty; some ascribing it to one pathological condition, others to another, and all acknowledging its obscurity; there is a propriety in adopting some designation, which, whether in itself correct or incorrect, may be generally received and understood. Most writers include under the title of *idiopathic tetanus* all cases not *traumatic*, whether strictly independent, or symptomatic of some other affection; and their example is followed in this work.

Still another distinction of tetanus is into the *acute* and *chronic;* but, though cases of the disease do differ greatly in their degree and duration, there is no such peculiarity of character attached to their diversity of grade and persistence as to require a separate grouping; and the terms, if employed at all, should be considered as mere epithets expressive of certain differences of quality in one common affection.

Symptoms, Course, &c.—Various symptoms are enumerated by authors as occasionally preceding an attack of traumatic tetanus; such as depression of spirits, an unaccountable feeling of terror, general uneasiness or lassitude, twitching in the wounded limb, deep pains in the affected part sometimes extending towards the spine, a sense of chilliness, &c.; but these symptoms are very uncertain, and cannot be relied on. The first signs of a commencing attack are commonly feelings of uneasiness and stiffness in the back of the neck; an unusual rigidity about the jaws, with some pain in attempting to open the mouth widely; and occasionally a disagreeable sensation in the throat, and slight embarrassment in swallowing. There is also frequently uneasiness in the epigastrium, which soon amounts to acute pain, shooting from the pit of the stomach towards the spine, and attended with a sensation of stricture or dragging, dependent, no doubt, upon spasm of the diaphragm. Other muscles become quickly involved, especially those of the face and trunk; the disease then extends to the limbs; and ultimately almost all the voluntary muscles of the body are more or less affected.

There is a permanent rigidity or tonic spasm of the muscles, which exists in various degrees throughout the complaint, seldom undergoing complete relaxation. Slight at the commencement, it increases with the advance of the disease, and, when this is fully formed, imparts a degree of hardness to the muscles, almost like that of a board. But, besides this state of permanent rigidity, there are paroxysms of spasm, approaching to the clonic character, which are much shorter, but proportionably more violent, and alternate with periods of comparative relaxation. These paroxysms are at first slight, and at somewhat distant intervals; but gradually increase in frequency and violence, until at length they occur every ten or fifteen minutes, or even more frequently, so that the patient is scarcely out of one before he falls into another; and their force is such that they sometimes throw the whole body about in different directions, and endanger injury from this cause.

These spasms produce extreme pain, of which some idea may be formed, when it is considered that the same feeling that attends ordinary cramps in the extremities is, in these cases, experienced in many muscles at once. The rigidity or permanent contraction is less painful, and is sometimes productive of no other sensation than a disagreeable stiffness. It is asserted, on high authority, that even the spasmodic paroxysms are not always painful; and one instance is related in which the sensation was said to be rather pleasurable than otherwise. The violence of the spasm is occasionally such as to produce a rupture of some of the muscular fibres or of the whole muscle, to fracture the bones, and to dislocate the joints. But these effects are comparatively rare.

The slightest causes are often sufficient to induce a paroxysm, such as an attempt to speak or to swallow, any sudden noise, a current of cold air, &c.

The effects of tetanus on particular parts and functions require notice. One of the most striking of these effects is the firm closure of the jaws, which has given rise to the name of *locked jaw* by which the disease is often designated. In some instances this takes place suddenly, as if by a snap; but generally it is effected slowly; the first feeling being that of stiffness, which increases until the patient becomes wholly unable to open the mouth; and the violence of the contraction is said sometimes to be so great as even to break the teeth. The other muscles of the face are also affected. The angles of the mouth are drawn upward and outward, the alæ of the nose are elevated and expanded, the brows are contracted, the forehead wrinkled, the orbicularis muscle of the eyelids rigid, the eyes themselves sometimes fixed and staring; and the whole face is much distorted, sometimes having an expression of anxiety and distress, sometimes exhibiting that fearful mockery of a smile, denominated the *risus sardonicus*, and generally presenting an aspect which the experienced eye at once recognizes as tetanic. The effect of the distortion is said occasionally to give an appearance of great age to the features even of the young. The pupil is in some instances contracted, in others dilated, and in others again unchanged. The tongue is liable to be thrust between the teeth while the jaws are somewhat relaxed, and then to be fearfully wounded by their sudden closure. Hence bloody froth or saliva sometimes issues from the mouth.

The trunk is often erect and rigid, as hard and firm almost as a wooden statue, in consequence of the equal contraction of the muscles. But occasionally the body is distorted by their partial action; those of one part contracting while the opposing muscles are relaxed, or act less forcibly. One of the most common distortions is that of opisthotonos, in which the whole body is bent backward into the form of an arch, so that only the occiput and the heels touch the bed. In this case, the abdominal muscles are also in general rigid, but their strength is insufficient to counteract that of the more powerful muscles placed along the spine. The forward curvature, or emprosthotonos, in which the shoulders are drawn towards the hips anteriorly, and the thighs flexed upon the pelvis, is comparatively very rare; and the lateral curvature is still more so; for, though it is no uncommon event for the muscles of one side to contract much more powerfully than those of the other; yet they very seldom act in such a manner as to bend the body laterally. The muscles of the extremities, as a general rule, are later and less affected than those of the trunk; though it is said that, in some instances of traumatic tetanus, the spasms commence in the wounded limb, and are severer there than elsewhere. It is a singular fact, that the muscles which move the wrists and hands are generally under the control of the will, though the trunk and arms may be rigid with spasm.

The muscles of the fauces, and those of the larynx, participate in some degree in the general tendency, giving rise to difficulty of deglutition, and occasionally to suffocative paroxysms, which are extremely distressing and dangerous. It is undoubtedly to spasm of the diaphragm that the violent and dragging pains at the scrobiculus cordis, extending through to the back, are to be ascribed. These pains are among the most characteristic symptoms of tetanus, being rarely quite wanting throughout the whole course of the disease. They generally begin and increase with it; but sometimes do not come on till in the advanced stage, or near the close. When very severe, they are apt to be attended with some degree of opisthotonos.

The sphincters of the anus and bladder are sometimes rigidly contracted, favouring constipation in the one case, and retention of urine in the other; and it has been observed, under these circumstances, that there is sometimes considerable difficulty in introducing the injection pipe and the catheter.

All the muscles, hitherto spoken of as liable to spasm, are in health either wholly or partially under the control of the will. Indeed, it is thought by some that the disease is confined to the voluntary muscles. They are certainly first and most violently affected. Life could be sustained but for a short time, if the involuntary muscles were equally liable to the disease. But there is no proof that they do not sometimes in the end participate; and it is not improbable that sudden death in tetanus may occasionally be owing to the disease seizing upon the heart.

An account of the state of the several functions will close this enumeration of the symptoms.

Deglutition, as before observed, is often difficult. When the attempt is made, in this case, to swallow liquids, they are apt to be thrown back through the mouth and nostrils; or, by entering the glottis, give rise to the most distressing paroxysms of dyspnœa, threatening suffocation. Hence, tetanic patients have in some cases a dread of liquids which is almost hydrophobic.

Notwithstanding this difficulty of swallowing, the patient generally retains his appetite. The tongue is at first, in uncomplicated cases, moist and natural; but is liable in the end to become dry or clammy, probably in part owing to the deficiency of liquid in the blood-vessels. Constipation of the bowels is an almost constant attendant on the disease. This has been ascribed to a spasmodic constriction of the intestinal muscles, to constriction of the sphincter ani, and to the deficiency of secretion into the alimentary canal consequent on excessive secretion from the skin. But the chief cause is probably the diversion of the nervous influence requisite to the due sensibility of the bowels, and its powerful concentration upon the voluntary muscles. The discharges are often unhealthy.

Respiration suffers greatly. The breathing is often short, hurried, and anxious; and, in consequence of the rigidity of the diaphragm and other respiratory muscles, the chest is so imperfectly expanded, that a feeling of the most painful dyspnœa is sometimes experienced. In its highest grade, this amounts to absolute suffocation; the air in the lungs is unchanged; the face becomes livid; and death takes place from apnœa. Another source of distress and danger is spasm of the glottis, an accession of which is probably sometimes the cause of those sudden deaths which occur in the midst of a spasmodic paroxysm. The patient, under these circumstances, evinces signs of intense agitation and suffering, and by clutching at his throat seems to show that the difficulty exists in the larynx. The disagreeable harshness of voice, occasionally observed in tetanus, probably has its source in constriction of the muscles of the glottis.

The circulation in pure cases of tetanus, when not excited by the action of the muscles, is often nearly or quite natural. But, as muscular contraction always calls for an expenditure of blood, the heart is stimulated to a more frequent action during the spasmodic paroxysms; while the intense nervous disturbance gives irregularity and inefficiency to its efforts. Hence, under these circumstances, the pulse is apt to be frequent, small, irregular, and feeble, especially towards the close of the disease, when the heart is exhausted by the combined influence of intense irritation and defective nutrition. During the most violent paroxysms, the frequency is occasionally very great; and Mr. Curling mentions a case in which it amounted to 180 in a minute. There is no fever, strictly speaking, in tetanus unassociated with inflammation; and blood drawn from the body does not exhibit the buffy coat. The temperature of the surface, however, is often above the natural standard, and sometimes very greatly so. In the case of a boy twelve years old, under the care of M. Prévost, of Geneva, a thermometer with the bulb in the axilla stood between 110° and 111° F.; and Dr. Bright describes a case in which the temperature in the axilla was 105°.

The patient often perspires profusely, probably in consequence of the violent muscular action and great suffering. A miliary eruption sometimes attends the profuse sweats. The other secretions are ordinarily diminished. The bile flows less freely, exhalation from the mucous membranes is somewhat checked, and the urine is generally scanty and high-coloured.

The mind is in general remarkably clear throughout the complaint. There is no stupor, no delirium, and little other cephalic affection, until near the close of the case, when the intellect sometimes wanders. The patient is apt to be sleepless from excess of pain, or, if he falls asleep during the lull of the paroxysms, is soon awakened by their recurrence. It is said that the spasm is relaxed during sleep. This is true of the paroxysmal spasm, but not generally of the tonic rigidity. The fact probably is, not that sleep suspends the paroxysm, but that it takes place in consequence of the suspension. Mr. Mayo relates the case of a boy, in whom the muscles were completely relaxed during sleep, and the spasmodic rigidity returned when he was awakened. Other similar cases have been observed. But it is well known that, in some instances of the disease, there is complete suspension of the muscular contraction, either spontaneously or under the effect of remedies. It could scarcely be otherwise, in such cases, than that the interval should be occupied by sleep. The spasm returns when the patient is awakened, because the slightest agitation often brings about this result.

It is a singular fact, that, though the violent spasms exhaust the excitability of the heart, they are not attended with the sense of fatigue that follows great muscular exertion under the influence of the will.

It should be borne in mind that all cases of tetanus do not present the whole series of phenomena above detailed. This disease has every possible grade, from a moderate stiffness of the muscles of the neck, of the jaws, of the back, perhaps of a single limb, up to those terrible cases in which almost every voluntary muscle assumes in its turn a board-like rigidity, alternating occasionally with the most fearfully painful spasm.

The course of the disease, moreover, differs in different cases. In some quite continuous, and advancing with an uninterrupted progress to a fatal result, it is in others remittent, and in others again intermittent; and this tendency to relaxation in the symptoms may be regarded as a favourable sign. In regard to its duration, it may terminate fatally in less than a day, or may continue for a week or more. Some doubtful cases are related, in which death has taken place almost immediately after the reception of the injury, or the commencement of the symptoms, and others, less suspicious, in which it has been postponed for two, three, or four weeks. But most frequently it occurs between the end of the first and beginning of the fifth day, and few survive the eighth day who do not ultimately recover.

Death occurs either from apnœa, consequent on spasm of the glottis or immobility of the respiratory muscles, or from pure exhaustion of the vital powers through excessive nervous excitement and want of nutrition, or possibly, sometimes, from a spasmodic seizure of the heart.

Recovery is usually slow and gradual. The spasm diminishes in violence and frequency, the rigidity relaxes, and not unfrequently the patient experiences a sense of formication in the limbs, as the muscles again come under the control of the will. Some cures take place in less than a week; but not unfrequently the disease runs on for several weeks, and sometimes two or even three months elapse before complete recovery. A certain degree of stiffness often remains long after the patient is deemed well. It is more especially the idiopathic variety that assumes the protracted form.

The disease is occasionally complicated with other affections. Sometimes epilepsy assumes something of the tetanic character; and we have, along with the coma and convulsions of that disease, a more or less extensive tonic rigidity of the muscles. Hysteria too is now and then associated with tetanic symptoms. Inflammation of the spinal marrow and brain, or of their meninges, is a more common accompaniment. In such cases, with the spasms of tetanus, we have pain along the spine or in the head, fever, loss of appetite, a furred tongue, a frequent pulse, perhaps delirium, paralysis, and ultimately coma before death.

Trismus Nascentium. There is an exceedingly fatal variety of tetanus which merits a distinct notice; that, namely, which occurs in infants soon after birth, and has received the name of *trismus nascentium.* It is much more common in hot than in temperate latitudes; and is very destructive among certain classes of the population in the West Indies, and portions of our Southern States. It is said also to prevail in certain isolated localities in high northern latitudes, as in one of the islets of Iceland, and in St. Kilda off the coast of Scotland, where the inhabitants live chiefly on fish, and in close, badly ventilated huts. In the South it affects especially the children of the blacks, and in some situations, while more than one-half of the coloured infants who are born die of the disease, scarcely a white child is attacked. The seizure takes place usually within the first week from birth, and has scarcely ever been noticed after the end of the second week. It is especially apt to be attended with spasmodic closure of the jaws, whence its name of *trismus nascentium*, though other muscles also are affected. It is usually ascribed to irritation arising from the cutting of the cord, and dissection has generally revealed ulceration at the umbilicus, with more or less inflammation of the investments of the umbilical vessels, and of the peritoneal membrane. Much influence has been ascribed to improper or careless dressing of the umbilicus, so common with the class of people among whom this affection is generally found.[*] A bad state of the infant's constitution, arising from the hot and foul air in which it has been born, and by which it has been influenced while in the fetal state, through the system of the mother, probably constitutes an essential predisposition. The disease is seldom cured. Many extensive practitioners, who have seen a great deal of it, have never known an instance of recovery. Out of forty cases collected by Dr. J. Lewis Smith, eight resulted favourably, which is a much larger proportion than that given by the practitioners generally whose reports I have consulted. (*Am. Journ. of Med. Sci.*, Oct. 1865, p. 315.) Prophylactic measures are, therefore, all-important; and experience has proved that attention to ventilation, cleanliness, and the proper management of the infant, has vastly diminished the prevalence of the disease.[†]

[*] This cause of trismus nascentium is much insisted on by Dr. John M. Watson, Professor of Obstetrics, &c. in the Nashville University, in a pamphlet upon this disease, published at Nashville, in 1851. Among the careless negro population of the South, where the disease most prevails, there is often extreme neglect of proper dressings to the umbilicus, which is not unfrequently found irritated by the urine and fecal matter with which the dressings are soaked, and offensive from the putrefaction of the cord. After extensive inquiries, Dr. Watson has found that the disease rarely, if ever, occurs when due attention is paid by an intelligent person to the dressing of the cord. This he believes to be one of the most effective prophylactic measures. Peculiar attention should be paid to the keeping of the part dry, and free from all sources of irritation, and especially from that of the urine or feces. After the separation of the funis, should there be the least appearance of irritation or inflammation, an emollient poultice should be applied. Besides this prophylactic measure, it is also important to provide for the general health, by attention to the usual hygienic influences, such as cleanliness, pure and fresh air, and wholesome diet, both in reference to mother and child, before and after delivery. (*Note to the third edition.*)

[†] In communications by Dr. J. Marion Sims, of Montgomery, Alabama, to the *American Journal of the Medical Sciences* (April, 1846, and July and October, 1848), new views have been advanced in relation to the cause of trismus nascentium, and very encouraging statements made in relation to its curability. According to Dr. Sims, the proper pathological condition is undue pressure upon the medulla oblongata and the nerves originating from it, produced by some displacement of the cranial bones, and especially of the occipital. In the far greater number of cases, the occiput is displaced inwardly, with its edges overlapped by those of the parietal bones. This the author considers as an ordinary physiological result of the parturient state, and as becoming a pathological condition only by persistence for some time after birth. Pressure made on the occiput by the position of the infant on its back is a cause of this persistence. The remedy is to restore the bone to its proper position, which may be done generally by placing the infant upon its side. In some instances, it may be necessary to resort to a surgical operation. (See the account of such an operation by Dr. Harrison, in the *Am. Journ. of Med. Sci.*, N. S., xvi. 75.) In twelve cases, the disease was cured by simply rectifying the position of the occiput. (*Note to the second edition.*)

Since the publication of Dr. Sims's paper, a case of trismoid disease has been successfully treated by Dr. Ostrander, of Brownsville, Missouri, upon his principles; but it is proper to state that real trismus had not been fully developed. (*St. Louis Med. and Surg. Journ.*, vi. 315.) Another, of a similar character, and with the same result, has been reported by Dr. Greensville Dowell, of Texas. (*Am. J. of Med. Sci.*, Jan. 1868, p. 51.) Dr. John

Anatomical Characters.—It often happens that, after death from tetanus, no material traces of disease can be discovered either in the brain or spinal marrow, at least upon simple inspection with the naked eye. Dr. Gerhard declares that he has examined these parts with great care in ten or twelve subjects, and could detect no lesion which seemed to have the least influence in the production of the symptoms. (*Tweedie's Syst. of Pract. Med.*, Am. ed., article *Tetanus.*) Dr. Todd has repeatedly examined, by means of the microscope, the spinal cords of animals killed by strychnia, without ever having been able to detect the slightest morbid change; and it is well known that the effects of this poison are closely analogous to the symptoms of tetanus. (*Lond. Med. Gaz.*, Sept. 1850, p. 915.) In many instances, however, sanguineous injection of the cerebral and spinal meninges, and of the roots of the spinal nerves, serous effusion into the cavities, and increased vascularity of the brain and spinal marrow have been observed. Blood has been noticed within the spinal sheath. In a few cases, evidences of inflammation have been offered in thickening of the meninges, softening of the medulla or brain, and cerebral abscess; and tubercles and other concretions have been found within the cranium. Small bony or cartilaginous plates have been repeatedly seen beneath the spinal arachnoid; and these have been supposed to have some agency in the production of the disease; but they are often wanting. Mr. Curling, though he has examined the spine with care in a dozen instances, has never met with them. (*Treat. on Tetan.*, Am. ed., p. 38.) In some cases of trismus nascentium, intense congestion was found in the cerebral and spinal meninges.

But a careful examination of the substance of the spine, with the aid of a microscope, has revealed an amount of disease of this structure, sufficient to account for the phenomena of tetanus; though the observations are, perhaps, not yet sufficiently extensive to serve as the basis of a theory as to its nature. In six cases which came under the notice of Dr. J. Lockhart Clarke, along with a congested condition of the exterior vessels of the cord, and more or less congestion of the medulla, though the appearances were normal to the unaided vision, there was found in all, with the aid of the microscope, a more or less extensive lesion of the structure, especially of the gray substance of the cord. This was deranged in position and shape, being sometimes as it were fused with the white substance, and was also changed in consistence from a slight softening even to fluidity. The vessels were surrounded by a granular exudation, which seemed to have broken down and destroyed considerable portions of the gray substance. These lesions were found, in isolated spots, in every region of the cord from the cervical to the lumbar. (*Lancet*, Sept. 1864, p. 261, and Aug. 12, 1865, p. 179.) To me it appears highly probable that the irritation, conveyed by the sensitive nerves to the gray substance, in which it has been ascertained that all these nerves terminate, causes inflammation of that tissue, with exudation and more or less extensive disintegration; while the white sub-

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M. Watson, however, in the treatise above referred to, denies altogether the origin of trismus nascentium in displacement of the cranial bones; and Dr. A. G. Mabry, in a paper on the diseases of Selma, Alabama, published in the *New Orleans Med. and Surg. Journ.* (vi. 620), states that he has never been able to discover any displacement of the bones of the cranium or vertebral column in this affection. (*Note to the third and sixth editions.*)

Two cases of trismus nascentium have been treated successfully with cannabis indica (*Indian hemp*) in Charleston, S. C., one by Dr. P. C. Gaillard, the other by Dr. H. W. De Saussure. The quantity given varied from about 6 to 15 minims of the tincture, at intervals of from half an hour to two hours. (*Charleston Med. Journ. and Rev.*, viii. 808.) Dr. N. Ransom, of Salem, Tenn., has recorded two cases of cure, which he ascribes to the internal use of chloroform; two or three drops being administered, in emulsion, after each paroxysm. (*South. Journ. of Med. and Phys. Sci.*, iii. 21.) Dr. H. L. Byrd, of Savannah, Geo., states that, of more than thirty cases seen by him, all had proved fatal except one, which had recovered under the internal use of oil of turpentine. (*Charleston Med. Journ.*, July, 1857, p. 475.)—*Note to the fourth and fifth editions.*

stance, which is the seat of the motor power, is highly irritated, without being destroyed, and hence produces all the spasmodic phenomena so characteristic of the disease.

The nerves involved in the wound, and proceeding from it towards the spine, have been found lacerated, reddened, thickened, softened, and otherwise variously altered; but the same phenomena have been observed in wounds not attended with tetanus. The ganglia, especially the cervical and semilunar, have also been found injected. Other occasional phenomena, noticed after death, have been rupture of the muscles, particularly of the rectus abdominis; an unusual rigidity of the muscles; worms in the alimentary canal; and signs of inflammation in the stomach, bowels, and peritoneum. The larger papillæ at the base of the tongue have been seen swollen, and the larynx injected, and lined by a frothy mucus. A greatly diminished bulk of the heart, with extraordinary firmness of its parietes, has been observed in one case; but this is a rare phenomenon.

Causes.—A peculiar predisposition is probably requisite to the production of tetanus; as comparatively few are attacked of those exposed to the exciting causes, though these may be to all appearance similar. In what this predisposition consists is unknown. That a long-continued prevalence of heat favours its production is highly probable; for the disease is incomparably more frequent between the tropics than in cold or temperate latitudes, and, in varying climates, is more apt to occur in the hot than the cold seasons. This at least has been generally admitted to be the case; but, from the account by Dr. Laurie of the cases treated in the Glasgow Hospital, and from the reported deaths from the disease in London for the ten years ending in 1851, it appears that, in Great Britain, the number of cases in the winter months is quite equal to that of the summer months, if not greater. (*Lond. Med. Times and Gaz.*, June, 1854, p. 620.)*

The disease appears sometimes to occur under epidemic influence, especially in the idiopathic form. Dr. J. E. Thompson, of Missouri, in a communication published in the *Boston Medical and Surgical Journal* (L. 314), states that, in the months of March, April, May, and June, 1853, he had attended no less than forty cases, of which two only were traumatic.

It has been supposed that a depraved state of health, resulting from bad diet, vitiated air, and a residence in low, damp situations, sometimes constitutes a predisposition; and yet the traumatic form of the disease often occurs in the young, robust, and vigorous.

Males are much more frequently and severely affected than females. This, no doubt, arises in part from the much greater exposure of the former to wounds, and other exciting causes; yet there is probably a constitutional difference in the two sexes in relation to nervous disease, corresponding in some measure with their respective physical energies; women being more liable to the mild affections of hysteria and chorea, while men suffer more from apoplexy and tetanus.

Persons are most subject to the disease from ten to fifty; but no age is exempt. It is rare in advanced life. As already stated, infants soon after birth are exceedingly apt to suffer from it, in certain regions within the tropics.

It appears to be a well-ascertained fact, that the negro is more disposed to tetanus than the white. Some have ascribed the difference to the greater exposure and worse living of the former; but, under apparently the same circumstances, negroes have appeared to suffer most.

Of the *exciting causes* incomparably the most frequent, in cold and temperate countries, are wounds or other kinds of external violence. Much stress has been laid by different writers upon the condition and character of the wound. Dr. Rush observed that it was destitute of inflammation; and other writers have noticed an unhealthy appearance, such as a pale or livid colour, an ichorous secretion, dryness, &c. But the general impression at present is, that tetanus is equally liable to occur in all conditions of the wound, whether healthy or unhealthy, before or after suppuration, in the process of healing, or after the healing has been completed; and the circumstance of the occasional vicious state of the wound is rather ascribed to the same constitutional tendencies which lead to tetanus, than considered as a cause of it. Whether the wound is trifling or severe, seems to be of little consequence. The slightest scratch will sometimes cause the disease, the most severe injury often fails to do so. As examples of the kinds of wounds which have given rise to tetanus, may be mentioned those produced by needles in the fingers, a splinter under the nail, the extraction of a tooth, a fishbone in the fauces, the insertion of artificial teeth, the cutting of corns, running nails in the feet, the insertion of a seton, cupping, fractures and dislocations, contusing and lacerating bodies, and all kinds of surgical operations. It is believed that lacerated and punctured wounds are worse in this respect than smooth cuts, and injuries of the fingers, soles of the feet, and joints, than wounds elsewhere. It is highly probable that, when the disease has been ascribed to slight injuries, perhaps already healed, it has sometimes originated from other causes. The interval between the reception of the wound and the occurrence of tetanus is very uncertain. According to the statement of authors, it may be a few minutes, a few hours, several days, or even weeks. Most commonly the attack comes on between the fourth and fourteenth day after the injury. If it should not supervene before the end of three weeks, the patient may be considered safe. The longer the interval, the milder generally is the attack said to be, and the more likely to end in recovery. The disease is thought to occur less frequently than formerly, in consequence of the greater care extended to the wounded, and the greater skill exhibited in their treatment. Soldiers wounded in battle are said to be more apt to suffer than those wounded in civil life, because so often exposed to cold, wet, and privations after their injuries, and often so badly cared for from the want of suitable surgical assistance.

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* Of 72 cases admitted into Guy's Hospital, London, in 32 years, 26 were in the three summer months, 20 in the autumn, 11 in the winter, and 15 in the spring; so that the warmer seasons very decidedly predominated. (*Guy's Hosp. Rep.*, 1857, p. 33.)—*Note to the sixth edition.*

Other local irritation besides that of wounds may occasion the disease. Thus, it is thought to have arisen from swollen gums, ulcers, intestinal worms, calculi in the bladder, and a dead fœtus in the womb; and has been ascribed to inflammation of the stomach and bowels. Inflammation of the spinal meninges is probably an occasional cause of it. Violent mental emotion, especially terror, has been accused of producing tetanus; and Dr. Rush relates a case in which it was ascribed to harsh grating sounds. Nux vomica and its kindred substances, in poisonous quantities, produce effects which cannot be distinguished from tetanus. I think it highly probable that rheumatism or gout may sometimes seize upon the medulla spinalis, and produce the phenomena of this disease. But infinitely the most common cause of that variety of tetanus which is independent of wounds, and is here denominated idiopathic, is exposure to cold, when the body has been hot and perspiring. Sleeping out upon the damp ground is a frequent cause; and the use of a cold bath when perspiring, or of very cold water as a drink under similar circumstances, is said to have produced it. Such exposure is the most frequent cause of the disease in tropical countries. It is apt to come on within a few hours after the exposure. When arising from this cause, it is more apt to be chronic and curable than when from wounds. The occurrence of traumatic tetanus is favoured by the co-operation of cold and other causes of irritation; and it is probable that the two causes together may give rise to it, when neither separately would have been sufficient.

Nature.—There is little doubt that the proper seat of tetanus is in the spinal marrow, including the medulla oblongata. The morbid action may extend also to the white matter of the brain. The absence of coma and delirium would indicate the want of participation of the cortical substance. That the disease does not reside in the muscles is proved by the instant cessation of the spasm, in any particular muscle, when the nerve by which it communicates with the spine is divided.

By some authors the disease is looked upon as simply a form of spinal meningitis or myelitis. But inflammation of an organ seldom leads to such an excess of function. On the contrary, it generally diminishes or abolishes function. Hence one of the most common results of inflammation within the spine is paralysis. It is true that inflammation of one part may extend an irritant action to another and sound part; and consequently we have tetanic spasms sometimes mingled with the other symptoms of myelitis. Hence tetanus does occasionally originate in inflammation within the spinal column. But the inflammation does not constitute the disease. It is only a cause of it; and in such cases there are symptoms of the myelitis or spinal meningitis, as pain and tenderness on pressure, fever, furred tongue, loss of appetite, and paralysis, mingled with the tetanic symptoms.*

Dissection often exhibits an injected state of the spinal and cerebral meninges, and, to a certain extent, of the nervous substance; but this is only congestion, not inflammation. It is in all probability the result and not the cause of the disease. Besides, even this indication of an excess of vascular action is sometimes wanting.

The phenomena, as well during life as after death, are best explained upon the supposition, that the disease is a mere irritation of the spinal marrow, including the medulla oblongata, and possibly, to a certain extent, the white cerebral fibres. This irritation may be propagated from the injured extremities of the nerves, as in wounds; or from other sources of excessive excitement, as the intestinal mucous membrane in verminose affections; or it may originate in the spinal marrow itself through causes acting on that structure, such as cold or rheumatic influence. The irritation, thus excited in the medullary columns, is extended to the muscles, and produces tetanic spasm, exactly as the same effect is caused by irritating the spine directly by running an iron wire into it, or by mechanical injury of one of the motor nerves proceeding from it. As before suggested, spinal meningitis may sometimes produce tetanus by extending an irritation to the nervous matter; and even myelitis, in one part, may give rise to a mingling of tetanic spasms with paralysis, by propagating irritation to a neighbouring sound part.

The vascular injection, without other marks of inflammation within the spinal canal, is the result of the irritation, just as redness of the conjunctiva is produced by neuralgia of the eye. How it should happen that the nerves of the wounded part should remain apparently quiescent for some time, occasionally even till the wound has healed, is one of the mysteries of which so many remain unsolved in relation to nervous action. We may conjecturally say that, at one period of the wound, the requisite irritability of the spinal marrow which constitutes the predisposition is not yet in existence, and is to become developed by the circumstances under which the patient may be placed. But, if this were true, it would only remove the difficulty a single step. It has been well ascertained that, though the spinal irritation may be set on foot by the local cause, it is afterward capable of sustaining itself, and may continue even though the cause has quite ceased to operate.

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* I have allowed this portion of the text to remain unaltered, because the observations, made by Dr. Clarke in relation to the state of the cord (see *page* 888), have not yet been sufficiently confirmed to justify the formation of new views based on them alone. It would seem, however, that one of the statements in the text, that inflammation in one part of the cord may extend an irritant action to another part, and thus cause the tetanic phenomena, is justified by these observations. The gray substance of the cord has been shown to be the part in which the sensitive fibres from without terminate; while the white matter consists probably of the motor fibres. According to Dr. Clarke, it is the gray substance that is chiefly diseased, the white being nearly sound; so that it is the irritant influence from the former, acting on the latter, that in all probability induces the tetanic contraction of the muscles. (*Note to the sixth edition.*)

We may infer that the upper portion of the column is first and most severely irritated, as it is in the parts of the body supplied with nerves from that region that the spasms are first produced, and are most violent, as in the face, back of the neck, and muscles of the chest.

The mode in which death is produced has been already explained; and it will have been observed that it is not inflammatory disorganization of the spinal marrow which causes the result, but an interference of the exterior effects of the irritation with the vital processes.

Diagnosis.—Tetanus is so striking in its characteristics that it can scarcely be confounded with any other disease. Hydrophobia resembles it in some points, but is very different in others. (See *Hydrophobia.*) Hysteria sometimes imitates it, as it imitates most other nervous diseases; but there are peculiarities, which almost always render diagnosis easy. (See *Hysteria.*) The rigid, permanent muscular contraction of tetanus, with the paroxysms of acutely painful and more fugitive spasm; the peculiar pain at the scrobiculus cordis; the trismus, difficult deglutition, and embarrassed respiration; the peculiar expression of countenance; and the absence of coma and delirium, except a little of the latter in the very last stage, are sufficiently characteristic. There may be occasionally some embarrassment in deciding how far certain cases, which appear to be a mixture of tetanus with other diseases, as with spinal meningitis, epilepsy, and perhaps we might add rheumatism and gout, should be considered as belonging to the one or to the other complaint. The poisonous effects of nux vomica may be looked on as a variety of tetanus. They can be distinguished only by a careful view of the circumstances which attended the origin of the affection.

Prognosis.—Traumatic tetanus is exceedingly fatal. Some who have seen much of the disease assert that they have scarcely known a case of recovery. The most successful report but a small proportion of cures. The journals, however, teem with cases which have ended favourably under one or another kind of treatment; and, though some allowance must be made for the probable idiopathic character of some of the cases considered as traumatic, yet there can be little doubt of the accuracy of the statements in the greater number; and sufficient encouragement is offered to the practitioner to persevere in an energetic use of measures which he may consider as indicated. The means of determining the general ratio of cures are altogether wanting; for it is not the custom to report unsuccessful cases. Out of forty-six traumatic cases, mentioned in *Curling's Treatise* as having occurred to several surgeons in tropical climates, ten, or rather more than one in five, recovered; and, as the disease is more severe in hot than cold climates, the average of recoveries may be considered as greater than that stated.*

The idiopathic form of the disease is much less fatal, and, as it occurs in temperate latitudes, is generally curable.

It is highly probable that the milder cases of tetanus, whether traumatic or idiopathic, would sometimes end spontaneously in health; so that caution is always necessary, in judging of the effects of remedies, not to confound them with the workings of nature.

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* Of 72 cases which occurred in the course of 32 years in Guy's Hospital, London, 62 ended fatally. But of these 8 were idiopathic, two of which recovered; so that the proportion of recoveries in the traumatic cases was 8 out of 69, or about 11·6 per cent. Fortunately the disease is comparatively very rare. Throughout England, in 6 years, one death occurred from tetanus for 8203 deaths from all diseases. (*Guy's Hosp. Rep.*, A. D. 1857, p. 17.)

Favourable circumstances are original mildness of the symptoms, complete relaxation between the spasmodic paroxysms, the absence of any great embarrassment of the respiration, a natural state of the circulation, the occurrence of sleep under the influence of remedies, and the protraction of the case beyond the seventh day. Extreme severity of the paroxysms, uninterrupted rigidity of many of the muscles, great difficulty of deglutition and respiration, an apparent tendency to spasm of the glottis, insusceptibility to the action of powerful remedies, and a very feeble, frequent, and irregular pulse are symptoms of very bad augury.*

Treatment.—One who depends upon authority alone would find extreme difficulty in coming to any satisfactory conclusion as to the treatment of this disease; for occasional, and perhaps equal success is claimed for the most opposite plans of management; and numerous remedies have been employed, each one of which is reported to have produced signal cures. But the fact appears to be, that the disease occasionally gets well of itself, and the credit is given to the medicine or medicines which may have been used, though possibly without the least influence over the result. Another difficulty in coming to a conclusion arises from the complexity in the means employed, so that it is impossible to determine how much of the resulting good is due to one, how much to another, or how much to their combination. In this uncertainty, the physician is thrown upon his principles; and will be justified in employing such measures as, according to his best judgment, may be indicated by the circumstances of the case, or may flow from his views of its pathology. The reader will bear in mind the views taken, in the preceding pages, of the nature of the disease; to wit, that it consists essentially in irritation of the spinal axis, giving a vast increase to the motor influence of that structure; and that, though it may occasionally be associated with inflammation, it is not essentially connected with that condition.

The following indications appear to be offered under this view of the disease; 1. to remove any existing source of irritation; 2. to lessen the susceptibility of the nervous centres to any irritating influence which may exist; 3. to diminish the irritation by means calculated to depress nervous excitement; and 4. to support the strength of the system, and especially of the heart, under the exhausting influence of the enormous muscular action.

1. *To remove any source of irritation.*—Attention should be directed to the state of the wound. It was at one time the custom to recommend the application of irritant and caustic substances, with the view of bringing about inflammation and suppuration. But satisfactory evidence is wanting that these measures have ever been beneficial; and it appears to me more accordant with

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* Mr. Colles believes that there are two distinct spasmodic affections resulting from wounds, which have hitherto been confounded under the name of tetanus. Confining the name of tetanus to the one which presents the ordinary phenomena of that disease, as described by authors, he draws the distinction between the two affections in the following manner. Tetanus seldom appears before the second or third week; begins with stiffness in the throat; presents a constant rigidity of the muscles, rendering deglutition very difficult, and giving a peculiar aspect to the features; is attended with pain, not in the wound but at the scrobiculus cordis; may continue for three or four weeks; is in no degree benefited by amputation; and is in some measure a constitutional affection. The other form of spasm comes on in three or four days; commences in the wounded limb; has intervals of relaxation in which the patient can swallow; is attended with pain in the limb, which is excruciating during the spasm; runs its course in three or four days; is relieved by no other means than amputation, which affords some chance of cure; and seems to have more of a local character than the other. (*Dub. Quart. Journ. of Med. Sci.*, xiii. 89.)

a rational view of the pathology of the disease, to endeavour to diminish irritation in the wound, by emollient and anodyne applications. Poultices, having solution of sulphate of morphia, chloroform, or some narcotic extract incorporated with them, would seem to be indicated. Dr. Brown-Séquard recommends, in cases where a large nerve has been injured, the subcutaneous injection of one-half a grain of a salt of morphia with one-fiftieth of a grain of a salt of atropia, in aqueous solution. (*Lancet*, Jan. 1866, p. 86.) Some advise the application of ice to the wound.

Early in the disease, if there is reason to believe that a nerve has been partially divided, contused, or lacerated, an incision may be made above the wound, so as to cut off its communication with the spine, provided the operation can be performed without considerable inconvenience. Several cases are on record in which such a measure apparently proved effectual.

Upon the same principle, amputation of the limb above the wound has been proposed; and the operation has been frequently performed in cases of traumatic tetanus, in which the wound was of such a nature as to require it, independently of the nervous affection. In a few instances, it appears to have arrested the disease when early performed; but it has failed in the great majority, and cannot, therefore, be with propriety employed merely for the tetanus. Indeed, this disease has frequently supervened upon amputation. The most that can be said in its favour is that, when the practitioner, in a case of severe injury, may be balancing between the propriety of amputation, and an endeavour to save the limb, the occurrence of commencing tetanic symptoms might be allowed to determine him in favour of the operation.

The division of the main nervous trunk, at a convenient point above the wound, has been practised in more than one instance with success. Decided symptoms of commencing tetanus, consequent upon a wound in the foot by a rusty nail, immediately gave way when the posterior tibial nerve was divided. (*Curling*, Am. ed., p. 71.) It is only, however, in the early stages that such operations can be performed with much hope of benefit. It is obvious that they can be at least but partially effectual, when the irritation has become established in the spinal marrow.*

The cauterization of the wound by iron heated to redness, or even whiteness, was recommended by Larrey, and has been since employed with supposed advantage. (See *Am. Journ. of Med. Sci.*, N. S., xix. 217.)

When there is any reason to suppose that the disease depends upon a decayed tooth, or upon one artificially inserted, it should be removed.

Feculent accumulation, as a source of great irritation to the nervous centres, should be removed at the beginning of the treatment. Practitioners are almost universally agreed upon the propriety of purging. Some brisk cathartic should be given, which will operate without materially irritating the mucous membrane. Senna and sulphate of magnesia, calomel combined with jalap or the compound extract of colocynth, calomel and castor oil, the compound cathartic pill of the U. S. Pharmacopœia, or, in case of any existing difficulty of deglutition, croton oil, might be selected. The bowels should be thoroughly cleansed at first, and afterwards kept open by mild cathartics, or enemata, as the case may require. Should worms exist at the same time, and especially the tape-worm, the best remedy would be a dose of oil of turpentine with castor oil, in the proportion of half a fluidounce or a fluidounce of the former to a fluidounce of the latter. Cases of the disease have given way after the expulsion of the tape-worm by this remedy.

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* Several successful cases of this kind are reported by Dr. Moses Sweat, of North Parsonfield, Maine, in the *New York Journ. of Med.*, N. S., vi. 194.

Dr. Brown-Séquard advises, in such cases, when the original wound has healed, or is healing, that the nerve should be laid bare, and sulphuric ether or one of the narcotic alkaloids applied. But he attaches also great importance to the section of the nerve, of which a small portion of the peripheral end should be removed, and submitted to microscopic examination; and, if this be found in an unhealthy condition, the operation should be repeated higher up the nerve in its course to the spine or cranium. (*Lancet*, Jan. 27, 1866, p. 86.)—*Note to the sixth edition.*

To meet the same indication, bleeding should be employed when the pulse is tense and voluminous, and suspicion of spinal inflammation exists; as, for example, when tetanus has followed an injury directly to the spine, or when the tetanic symptoms are associated with pain and tenderness of the spine on pressure, formication or numbness of the lower extremities, and fever. Here the bleeding is intended to cure the inflammation, which may aggravate, if it does not cause the tetanic symptoms. Blood should be taken freely from the arm, and by cups from the spine. But bleeding in simple tetanus, without symptoms of spinal or cerebral inflammation, and especially when the pulse is not strong, appears to me not only uncalled for, but, in view of the great tendency to prostration in the advanced stage, highly hazardous.

In similar cases, mercury may be employed as an adjuvant to the lancet, for the cure of the spinal inflammation; and it should be pushed energetically to the point of salivation. For this purpose calomel may be given very freely by the mouth, and mercurial frictions employed externally. To be useful, the impression must be promptly made. Mercury has often been used in ordinary cases of tetanus, and has been highly recommended by some practitioners. But, though many successful cases are on record, yet it is impossible in most of them to determine whether the result was ascribable to the mercury or the other means employed; and ample evidence might be adduced to prove, not only that it has very often failed, but that patients have in numerous instances been attacked by tetanus while under the mercurial influence. It possesses, therefore, no specific curative powers; and as, on the occurrence of ptyalism, the presence of saliva in the mouth may prove a source of excessive distress to the patient, from his dread of swallowing it, and yet inability to discharge it conveniently through his closed teeth, the medicine should be used only when the indication for its powerful antiphlogistic influence is called for.

2. *To diminish the susceptibility of the nervous centres.*—The remedies calculated to meet this indication are chiefly the narcotics or cerebral stimulants. One of the most effectual of these, and the one which has been most employed, is opium. Much difference of opinion has existed in relation to the propriety of using it. Notwithstanding the contrary judgment of some distinguished authors, I cannot but think that the weight of testimony is greatly in its favour. It has probably been employed as one of the remedies in the great majority of cures. It is true that it has often failed. But in many cases all remedies fail. It is true, moreover, that it has been vastly abused, and that it has been murderously administered in some cases. What can be thought, for example, of a practitioner, who in the course of ten days should prescribe half a gallon of laudanum, and half a pound of opium? And yet this is said to have been done in tetanus. Should the violent nervous symptoms yield in such cases, what could be expected but death from the opium remaining in the stomach? There is in tetanus an extraordinary insusceptibility to the action of opium; and the most enormous doses have been without apparent narcotic effect. In such cases, it is probable that the greater portion remains unabsorbed and inert in the stomach; but it is there, prepared to act, when the insusceptibility, or the obstacle to absorption, shall cease. If good do not accrue from opium in less than poisonous doses, it is useless to persevere. The liquid forms should always be preferred to the solid, as more readily absorbed. From half a fluidrachm to a fluidrachm of laudanum, from thirty to sixty drops of the vinegar of opium, or from half a grain to a grain of one of the salts of morphia in solution, may be given every two hours until some nar-

cotic effect is experienced, or the patient relieved; and, if no effect is produced in due time, the dose may be somewhat augmented; but I should prefer applying the medicine additionally to other surfaces, without increasing the quantity by the stomach. Thus, a grain or two of the sulphate of morphia may be injected into the rectum; or twice the quantity sprinkled upon a denuded surface in the epigastrium, obtained either by means of a fly blister, or more speedily by the application of the strongest solution of ammonia. The subcutaneous injection of the narcotics might also be resorted to. In idiopathic cases, or when there is much strength of pulse, the opiate may be associated with ipecacuanha or tartar emetic. A case is recorded in which a cure seems to have been effected by the smoking of opium; 84 grains of the drug, on the average, having been consumed daily during the treatment. Much of the medicine was of course lost in the process. (Dr. J. Fayrer, *Ed. Med. Journ.*, Feb. 1865, p. 716.)

When a narcotic effect can be obtained by the opium, relief is generally experienced, and the symptoms ameliorated. Should opium fail, recourse can be had to extract of hemp, which has been highly recommended, and is thought to have effected cures in several cases. The great disadvantage of this remedy is the uncertainty of its strength; and the dose of any particular parcel must be ascertained by its effects. Two or three grains of the extract may be given at first, and repeated every half hour until its narcotic effect is experienced. In three or four hours, should it produce no effect, the quantity may be increased gradually till the dose amounts to ten grains; but the interval should now be lengthened to two or three hours.

Woorari has been used, to meet the same indication, by Dr. L. Vella, of Turin, and Dr. T. Spencer Wells, of London. The former applied first to the wound, and afterwards to a blistered surface, a solution containing a grain and a half of the narcotic in somewhat more than a fluidounce of water, repeating the application daily in the beginning, and, when made to the blistered surface, every five hours. After each application the patient was relieved for a time; and, though for the first three days the spasms returned with their original violence, yet at the end of this period, they gradually abated, and the patient ultimately recovered. (*Arch. Gén.*, 5e sér., xiv. 499.) In three cases in which it was used by Dr. Wells, one recovered. (*Lancet*, Dec. 1859, p. 562.)

Alcohol is another remedy by which the same indication may sometimes be fulfilled. The object in the use of this medicine is to bring about its cerebral influence; in other words, to intoxicate the patient, so that his brain and spinal marrow may be blunted to all impressions. Cures have repeatedly followed this plan of treatment. The nervous system has the same insusceptibility to the influence of this cerebral stimulant as to that of opium, and it is necessary to employ large quantities. The use of wine was strongly recommended by Dr. Rush, and has had many advocates. Brandy would be more effectual; and alcohol has been recently employed. The quantity to be used is almost indefinite. Quarts and even gallons of wine have been used daily for many days together. As soon as symptoms of stupefaction appear, the stimulant should be suspended, and resumed when they cease, should the tetanus not have yielded. I confess that I prefer the opiate plan, and would resort to the alcoholic only in case of obvious weakness of the circulation, or as an adjuvant of the opium. It should, of course, never be used where there are symptoms of spinal inflammation.

Stramonium and belladonna have also been administered; but when opium and hemp fail, little good can be expected from these narcotics. A case, however, is recorded, in which recovery took place under the influence of one-twentieth of a grain of atropia, given every three hours. (*Va. Med. & Surg. Journ.*, xiii. 60.) Frictions over the whole body with a strong tincture made by rubbing up five parts of the extract of belladonna, and eleven of alcohol, are said to have proved effectual in one case. (See *Lond. Med. Gaz.*, Aug. 1850, p. 263.) Immersion in a bath, made by infusing hops in boiling water, afforded great relief in a case recorded by Dr. J. M. Minor, and was believed by him to be the main instrument of the cure. (*N. Y. Med. Times*, iv. 38.)

Numerous cases have been recorded in which recovery from tetanus followed the inhalation of ether or chloroform, and others in which these remedies afforded great relief, without preventing a fatal issue. Chloroform, however, must be used in this manner with great caution; as it is powerfully and sometimes fatally sedative; while one of the great dangers of the disease is from exhaustion. The same remedy is said to have been used successfully, applied by means of friction over the whole surface of the body.

3. *To diminish directly the nervous irritation.*—This indication may be met by two sets of measures; *first*, those which are sedative to the nervous system; and *secondly*, those which act revulsively. Of the former the most efficient is tobacco. Many cures, said to have been effected by this powerful sedative, are on record; and it is probably among the most efficacious remedies in tetanus. It is singular that, while the nervous system is so insusceptible to the influence of opium and the other cerebral stimulants, it should be easily impressed by tobacco and the nervous sedatives generally. But this remedy must be used with caution. The system may be easily prostrated below the point of reaction. The best form of administration is by enema. Half a drachm may be infused in half a pint of boiling water, and the whole administered by injection. In an hour, if no effect is experienced, the dose may be repeated; and afterwards at intervals of two or three hours till its relaxing effects are obtained. The tobacco bath has also been used; but, while immersed in this the patient should be closely watched, and removed immediately upon the occurrence of signs of prostration. The same sedative may be applied in the form of a cataplasm along the spine. The alkaloid nicotia has been substituted for tobacco, with equally favourable effects. Out of four cases reported by Rev. Sam. Haughton, two recovered. The dose was one-half of a drop, three or four times a day, increased to three-quarters of a drop, till its effects were experienced, among which was profuse perspiration. (*Braithwaite's Retrosp.*, No. 46, p. 185.) Should prostration ensue from the use of tobacco in any of these forms, it must be counteracted by carbonate of ammonia, brandy, or ether; and the narcotic has been successfully employed conjointly with stimulants.

Digitalis and hydrocyanic acid have been employed for the same purpose as tobacco; but they are less efficient and not so manageable. Another remedy, indicated from its powerful sedative properties, is aconite. A case has been recorded in which it proved successful, in doses of four drops of the saturated tincture of the root, repeated until symptoms of its peculiar poisonous action were induced. Tincture of lobelia was used, with supposed advantage, by Dr. J. McF. Gaston, of Gaston, S. C. (*Charles. Med. Journ.*, xi. 58.) Calabar-bean has been employed to meet the same indication with encouraging success. For the dose and mode of exhibition, the reader is referred to the U. S. Dispensatory (12th ed., p. 1482). In a patient who recovered, Mr. Holmes Coote, of London, gave one minim of a fluid extract, containing the strength of four grains of the powder, every hour or two; but, as other remedies were used, it is impossible to determine how far the result was ascribable to this medicine. (*Med. T. & Gaz.*, March, 1864, p. 348.)

Dr. Poitevin, of Mobile, succeeded in one case of the disease, with tartar emetic and laudanum, given so as to sustain a profuse and constant perspiration; but Dr. Dowler, of New Orleans, found the remedy to fail in a case in which he subsequently tried it. (*N. O. Med. and Surg. Journ.*, x. 769.) Tartar emetic alone, given as freely as possible, so as not to provoke vomiting, proved successful in two cases, in the care of Dr. Conway, of Neuchatel. (*B & F. Medico-chirurg. Rev.*, Jan. 1861, p. 175.) The same remedy has been used in the form of enema.

Chloride of barium is supposed to exercise a favourable influence over the spinal affection. Dr. Brown-Séquard recommends it as peculiarly applicable to tetanus; and a cure is said to have taken place under its use, in a severe case of the disease, by Dr. Gnecchi, of Milan, who gave sixteen grains of it dissolved in a pint of distilled water in the course of 24 hours, and repeated the same quantity daily, diminishing the dose as the patient improved. (*Am. Journ. of Med. Sci.*, July, 1862.)

The external application of cold water is another sedative measure which has often proved effectual. It is necessary that the water should be little above the freezing point, say 40° F., or between that and 50°. It may be poured from a considerable height by pailfuls on the naked patient, or may be used as a bath. Great reduction of the vital actions is induced, with relaxation of the spasms; and the remedy must be reapplied at proper intervals on their return. After its use the patient should be put into bed, wiped dry, and stimulated by carbonate of ammonia, and hot spirit if requisite. But the plan is hazardous, and death from syncope has resulted in at least one instance. Ice to the spine has been successfully used.*

The warm bath is another sedative which has sometimes been employed, though scarcely energetic enough to produce much effect in the more violent cases. It is recommended in the muscular rigidity which is apt to remain during convalescence. Cures by the vapour bath have been reported.

The second mode of meeting the indication is by revulsives. A blister along the whole length of the spine has been employed. But the most effectual plan is that put into practice by the late Dr. Jos. Hartshorne, of this city. It consists in applying along the spine, from the occiput to the sacrum, a solution of caustic potassa, containing two or three drachms of the alkali in four fluidounces of water. This is rubbed upon the skin by means of a sponge until the surface is much reddened, and signs of a caustic action are displayed, in some one point, by the discoloration of the skin. The remedy may be repeated when the inflammation disappears. It has been used with success in a number of cases. Dr. Hartshorne relied chiefly upon it, with opium moderately employed, and purging. He informed me that he had effected cures in six or seven instances.

4. *To support the strength of the system.*—This becomes all-important in the advanced stages, when the heart begins to give way. Whenever the pulse is feeble, no matter what may be the stage of the disease, cordial medicines and nutritious food should be employed. Wine and ardent spirit, milk, animal broths, the yolk of egg, &c. should be freely used. Sulphate of quinia may be administered with the same view.

Besides the remedies above enumerated, many others have enjoyed more or less credit. One which promises fairly, and which experience has shown to be apparently efficacious, is *sulphate of quinia*, used not merely as a tonic but with a view to its peculiar influence on the system in heroic doses. A drachm of it may be given in twenty-four hours, unless found to produce its characteristic effects on the brain in smaller quantities.

Subcarbonate of iron is another tonic which has been employed with asserted success. It has been used in enormous quantities, in one instance to the extent of half an ounce every two or three hours, and even of a pound daily.

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* Dr. B. D. Carpenter, of Cutchogue, Suffolk Co., Long Island, reports two cases of severe traumatic tetanus, which recovered under the use of ice applied to the head, and along the whole length of the spine. The application was repeated at intervals varying from two to eight hours, and continued from ten to thirty minutes each time. (*New York Med. Times*, ii. 46.)

These enormous doses are probably quite unnecessary; for of the quantity taken a very large proportion must remain inert in the bowels.

Oil of turpentine has had no little reputation in the treatment of tetanus. Cures effected by it have been reported. It may be given in the dose of a fluidrachm, repeated every two hours until it evinces some disagreeable effect, or the patient recovers.

Acetate of lead in large doses, musk, carbonate of potassa, colchicum, strychnia, electricity or galvanism, and extract of stramonium or other narcotic injected into the veins, are remedies, which, alone, or conjointly with some of the measures above enumerated, are said to have effected cures. In relation to electricity, M. Matteucci, so early as 1838, published a case of tetanus to prove the efficacy of the continuous current in this disease. (*Arch. Gén.*, Mars, 1864, p. 372.) The same is the case with acupuncture. In a severe case, in which other means had failed, and the patient seemed in a hopeless state, Dr. J. Alexander Grant introduced three needles in the rigid muscles of the neck, on each side of the spine, with the effect of giving immediate relief. They were withdrawn after a minute, and subsequently inserted daily, in the contracted muscles of the cervical, dorsal, and lumbar regions. The patient gradually improved, and ultimately recovered completely. (*Med. T. & Gaz.*, Nov. 1865, p. 495.)

A patient of Cruveilhier recovered by sustaining, through voluntary effort, a constant regular respiration, in measured time, the inspirations being as deep as possible. This was kept up for four hours, when the patient fell into a profound sleep. It was renewed again when he awoke, and continued until he again fell asleep. After this the paroxysms were milder, and he gradually recovered. (*Braithwaite's Retrospect*, xxi. 96.)

The following is a brief summary of the remedies which seem to be indicated, viz., the removal or correction of obvious sources of irritation; active purgation; bleeding when the pulse is strong, and symptoms of spinal or cerebral inflammation exist; the use of opiates, hemp, tobacco, or aconite, and the inhalation of ether or chloroform; the cautious use of the cold bath; the application of a solution of caustic potassa or a blister along the spine, or of ice to the same part; and the free employment of alcoholic stimulants, and nutritious food, when debility appears.

In consequence of the closure of the jaws, there is occasionally some difficulty in introducing food; but a vacancy can generally be found, either from the loss of a tooth or behind the last teeth, large enough for the admission of liquids. A greater difficulty is that often attendant upon deglutition. To obviate this it may be necessary to inject the food into the stomach through a tube, or to attempt to supply the place of food by nutritious enemata.

Article V.

HYDROPHOBIA.

Syn.—*Rabies.*—*Rabies Canina.*

HYDROPHOBIA (from ὕδωρ, water, and φόβος, fear) is a peculiar disease, resulting from the entrance into the system of the poison of a rabid animal. The poison is almost always received through a wound, generally the bite of the animal. This heals like any other wound, and for some time no peculiar or constitutional effects are experienced. It is seldom that the first symptoms of the disease appear before the twentieth day after the injury.

Symptoms, Course, &c.—The first warning of the approaching attack is frequently a feeling of pain in or near the seat of the wound, extending to wards the trunk. If not acute pain, there is generally some unusual sensation, such as aching, tingling, burning, coldness, numbness, or stiffness, in the cicatrix, which swells, becomes of a reddish or livid colour, sometimes opens, and, if yet unhealed, assumes an unhealthy appearance, and discharges a thin ichorous fluid instead of pus. Along with these local symptoms, some nervous disturbance is generally experienced; the patient becomes dejected, morose, irritable, restless; light is disagreeable to him; his sleep is troubled; pains are felt in various parts of the body; and signs of digestive disorder are not unfrequent. After the continuance of one or more of these preliminary symptoms for a period varying from a few hours to five or six days, and sometimes without any of them, the patient becomes sensible of a stiffness or stricture about the throat, and, in attempting to swallow, experiences some difficulty, especially in the deglutition of liquids. This may be considered as the commencement of the attack. The difficulty of swallowing rapidly increases, and soon the act becomes impossible unless with a resolute effort, exciting the most painful spasms in the fauces, and other indescribable sensations, which appear to appal the patient, and cause him to dread the very thought of liquids. Singular nervous paroxysms come on. Sensations of stricture or oppression are felt about the throat and chest; the breathing is painful, embarrassed, interrupted with frequent sighs, or a peculiar kind of sobbing movement; there is a sense as of impending suffocation, and of necessity for fresh air; shuddering tremors run through the whole frame, sometimes amounting almost to convulsions; and a fearful expression of anxiety, terror, or despair, is depicted on the countenance. The paroxysms are brought on by the slightest causes, and are frequently associated with the attempt to swallow liquids, or with the recollection of the sufferings experienced in former attempts. Hence, anything which suggests the idea of drinking to the patient will throw him into the most painful agitation, and convulsive spasms. The sound of water poured from one vessel into another, the sight of liquids or of objects which bring them to mind, as of the shining surface of a mirror, a current of cold air, or other cold substance touching the skin, may have this effect.

Another characteristic feature of the disease is a copious secretion of a viscid mucus in the fauces, which the patient spits out, with a sort of frantic vehemence and rapidity, upon everything around him, as if the idea of swallowing occasioned by the liquid induced this eager expulsion of it, lest a drop might pass down the throat. This to a by-stander is sometimes one of the most striking phenomena of the case.

Acute, and, as it were, electric shocks of pain are now and then felt in the epigastrium, the back of the neck, and other parts of the spine.

The mind is sometimes calm and collected in the intervals between the paroxysms, and consciousness is generally retained; but, in most cases, there is at times more or less mental irregularity, and occasionally spells approaching to insanity come on. Not unfrequently the patient is aware of the approach of these spells, and, fearful of doing injury to others, begs that he may be restrained. The mental aberration is often exhibited in groundless suspicion or apprehension of something extraneous, which is expressed on the face and in the manner of the patient. Sometimes, on the contrary, he takes a curious fancy to individuals, and lavishes on them marks of fondness and confidence. In comparatively rare instances, he gives way to a wild fury, like that of a savage beast when enraged; roars, howls, curses, strikes at persons near him, rends or breaks everything within his reach, bites others or himself; till, exhausted at length, he sinks into a gloomy, listless dejection, from which another paroxysm arouses him.

The tongue is usually somewhat furred. There is often burning in the throat, with thirst which cannot be gratified. Sometimes there is a sense of hunger, sometimes nausea with vomiting. The pulse is excited, sufficiently strong at first, but weaker as the case advances, and extremely feeble and frequent before its close. The skin is warm or natural in the beginning, but becomes cool in the end, and is often covered with a viscid, offensive sweat. Not unfrequently paralytic symptoms come on before death.

Remissions of the symptoms sometimes occur in the course of the complaint; during which the patient can drink, though with some difficulty, and can take food. Towards the close, such a remission is not uncommon, with an absence almost complete of the painful symptoms, so that the patient and the physician begin to entertain some hope. But if the pulse is now felt, it is found to be extremely feeble, and sometimes wanting. During this apparent relaxation of the disease, the patient occasionally falls into a sleep, from which he awakes only to die. The closing scene is marked by an excessively feeble or absent pulse, a cold skin, involuntary evacuations, and wandering or delirium; and death approaches either quietly, as a consequence of complete exhaustion, or in strong convulsions.

The disease generally terminates between the second and fifth day, though it sometimes runs on to the seventh, eighth, or ninth.

Anatomical Characters.—Nothing has been found which can throw any satisfactory light upon the disease. Not unfrequently the brain and spinal marrow are both perfectly sound. In a case examined by Dr. Sidey, of Edinburgh, the brain and its membranes were found quite healthy, as were also the medulla oblongata, the spinal cord, and the eighth pair of nerves at their origin and in their course, though inspected with great care both microscopically and by the naked eye. (*Ed. Month. Journ. of Med. Sci.*, Dec. 1850, p. 505.) It is true that turgescence of the vessels, and injection of the spinal and cerebral meninges have often been observed, and, in some rare cases, softening of portions of the medulla spinalis. But the congestion might well be a mere consequence of the terrible agitation of the nervous centres, without of itself contributing in any degree to the disease; and the admissible signs of inflammation are too seldom seen to warrant the belief, that this process has any essential connection with the phenomena.*

The mucous membrane of the fauces, trachea, and œsophagus is in some instances reddened, in others pale, and, in either case, is apt to be covered with an adhesive mucus. The papillæ on the back part of the tongue are sometimes very much enlarged. The salivary glands, though sometimes enlarged, are in the great majority of cases, in man at least, unaltered; and nothing in their appearance is of a nature to throw light on the disease. Signs of inflammation of the inner coat of the stomach have often been noticed. The lungs, too, have been frequently found to be engorged. The blood is altered in appearance, and sometimes confined exclusively to the arteries. The body is strongly disposed to putrefaction, and quickly becomes offensive.

Causes.—There is one cause, and probably but one of genuine hydrophobia. Some believe that it may originate in man independently of any poison from without; but the cases are extremely rare in which this is supposed to have occurred; so much so as by their very rarity to excite suspicion as to the accuracy with which they have been reported, or the soundness of the diagnosis. It is certain that some of the symptoms of hydrophobia are imitated by spontaneous nervous disease. The difficulty of swallowing, and dread of fluids have often been noticed. Terror has sometimes induced trains of symptoms closely resembling those of the genuine disease. Hysteria also occasionally counterfeits it. But these are comparatively trivial affections, and undeserving of the name of hydrophobia. In the very rare cases which have pursued exactly the course, and had the termination of that disease, it is much more probable that the patient may, in some way forgotten or unknown to himself, have received the poison into his system, than that the complaint should have risen from any other cause.*

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* In the case of a child recorded by M. Jules Bergeron, of Paris, the cerebral sinuses and all the superficial veins were engorged with blood, the pia mater was strongly injected, the substance of the brain was manifestly softened, the gray substance when cut presented a rosy hue, there was no serum in the ventricles, the spinal meninges were not obviously injected, but the medulla oblongata and spinal marrow were softened equally with the brain, and the roots of the cranial nerves were extremely fragile. The blood in the heart was black and fluid. The posterior papillæ of the tongue were much developed, and the mucous membrane of the epiglottis, the folds of the glottis, and the pharynx were strongly injected; but not that of the œsophagus, or of the larynx below the glottis. (*Arch. Gén.*, Fév. 1862, p. 144.)—*Note to the sixth edition.*

The poison is contained in the saliva or mucus of the mouth of the rabid animal, and, as before stated, is generally imparted by a bite. It is from the dog that the disease is most frequently received. But many other animals are capable of imparting it. The cat, fox, badger, wolf, jackal, and pole-cat of this country (De Jernett, *Bost. M. & S. Journ.*, lix. 528) are known to have communicated the disease. There is good reason to believe that the saliva of the horse, ass, ox, &c., labouring under hydrophobia, will produce the same effect, if introduced into the system; but, as these animals do not usually bite, the result does not often occur. The same remark may be made of birds. I attended, with the late Dr. Otto, of Philadelphia, a young man affected with clearly marked hydrophobia, who informed us that he could remember no other bite than one which he had received from a *hog*, about three months previously, as he was crossing one of the streets. The question has not been certainly decided, whether the saliva of the human subject affected with hydrophobia is in like manner poisonous. But one experiment of MM. Magendie and Breschet strongly supports the affirmative of this question. Two healthy dogs were inoculated with the saliva of a hydrophobic patient. One of them was seized with the disease, and imparted it to other dogs by biting them. This may have been a mere coincidence, and cannot be admitted as positive proof without the support of additional facts. On the whole, it appears to me highly probable that the saliva of any animal, affected with hydrophobia, is capable of imparting the disease to others.

An important point of inquiry is by what means the poison can find access into the system. We know that it commonly enters through a wound. But will it produce the effect if applied to the skin with the cuticle sound? The probabilities are that it will not. There is, I believe, no authentic instance of the disease having been communicated in this way, though there have been numerous opportunities. But the question is not so certain in relation to the mucous membranes. Mr. Youatt, who has had ample opportunities of observation, thinks that the disease may be communicated through these membranes with the epithelium entire. It is asserted that persons have been attacked with hydrophobia in consequence of having wiped their mouths with linen which had been impregnated with the saliva of a mad dog; and a case is mentioned in which the disease originated from an attempt to untie by the teeth a knot in a cord by which one of these diseased animals had been fastened. Horses, oxen, and sheep are said to have contracted the disease by eating the straw upon which mad dogs have lain.

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* Since the publication of the second edition of this work, two cases of seemingly spontaneous hydrophobia, both ending fatally, have been recorded, one by Dr. Mombert, in the eighth volume of Walther and Ammon's Journal (see *Am. Journ. of Med. Sci.*, N. S., xvii. 476); and the other by Dr. Condie in the *Transactions of the College of Physicians of Philadelphia*, ii. 450.

Another case has since been recorded by Dr. Henrich, in *Henke's Zeitschrift* (Band 58, s. 361), which occurred in a day labourer, and proved fatal with all the characteristics of the disease, and which could not be traced to any animal whatever. (*Med. T. & Gaz.*, June, 1859, p. 584.)—*Note to the sixth edition.*

Another very interesting question is, how long the poison remains in the system before producing its effect. The period is very uncertain. The disease seldom makes its appearance earlier than the eighteenth day after the bite, or later than the third month. The most common period is from the twentieth to the sixtieth day. But the period of incubation is sometimes much longer than the longest mentioned. Thus, instances are on record in which the attack did not occur until six, nine, twelve, or eighteen months after the wound; and, in some very rare cases, it is asserted to have been postponed for two, three, and even ten or twelve years. These last cases, however, are liable to the suspicion of inaccuracy. Other diseases may have been mistaken for hydrophobia; or there may have been some more recent and unknown or forgotten source of contamination. If it be admitted that the saliva of a hydrophobic animal can produce the disease by contact merely with the mucous membrane, it can be readily perceived how many opportunities for its occurrence may happen, altogether without the knowledge of the individual affected.

It may be considered as highly probable that, in persons into whose system the poison has been received, certain exciting causes may produce a more speedy development of the disease than would ordinarily take place. Among the causes of this kind, enumerated by authors, are insolation, excessive fatigue, intemperate drinking, a blow on the cicatrix, and terror.

Of those bitten, many are never attacked with the disease. It is possible that some systems are insusceptible to the poison; but a better explanation is, that the saliva is wiped from the teeth by the clothing through which the bite is made, and therefore does not penetrate the wound. Besides, in our ignorance of the precise source of the poison, we do not know that it is at all times present in the saliva; and it may happen that, a certain amount only being produced in a given time, that quantity may be exhausted when the animal bites frequently; and consequently that those bitten last will stand the best chance of escape. This is stated to be actually the case. It is said that some animals are more poisonous than others. Thus, of those bitten by the wolf, a much larger portion is attacked than of those bitten by the dog. This, however, is explained by the asserted fact, that the wolf generally flies at a naked part, as at the face. Of 114 cases of persons bitten by mad wolves collated by Dr. Watson, 67 died; while of 15 persons bitten by a mad dog only three died, and John Hunter states that he knew an instance in which 21 were bitten and only one died.

How does the poison operate, and why should it lie so long apparently inert, and then be suddenly excited into such fearful virulence? The only plausible explanation is, that the poison of hydrophobia, like that of small-pox, is capable of propagating itself, either by a chemical action analogous to that of fermentation, allowing it to be unorganized, or by the development of germs, if it be supposed to be organized. The germ, lodged within the body, requires time for the reproductive process to be completed; and this process may be hastened or retarded by various conditions of the recipient not readily appreciable. Common poisons, as arsenic, hydrocyanic acid, and the venom of the rattlesnake, which are absorbed, and operate directly upon the system, produce their effects immediately. The hydrophobic poison requires a period of incubation; and often remains long undeveloped in the nest provided for it. When at length circumstances favour the hatching process, the new brood leaves its birthplace in the cicatrix, and carries destruction into the system. A consolatory inference is, that, if the nidus be wholly removed before the hatching is completed, the mischief may be prevented.

It has been conjectured that the bite of an enraged animal, not labouring under disease, might produce hydrophobia; but the conjecture is improbable, and wholly wanting in proof.

remedy. These pretended remedies are not only us
useless, by producing a false confidence, and inducing
in them, rather than undergo the pain and inconveni
measure. As to the discovery, some years since
third to the ninth day, vesicles are developed under
zone in which the poison is concentrated, and the re
sequent cauterization, would save the patient; it ha
its apparent absurdity merited. The vesicles have b
numerous observers.

Several questions here present themselves; to wit
individuals, and in what manner, the operation shou

In the *first place*, as to the time, certainly the sc
been received the better; but at any time whatever,
two years after the reception of the wound, and befo
of the disease. Even after the premonitory sensation
tion in the cicatrix have occurred, it is not too late.
should lead to an immediate employment of the me

In the *second place*, as to the individuals upon w
be performed: I would unhesitatingly say, upon all
understood to have been mad. In many instances,
necessary; but no one can foretell what is to be tl
case; and it is better that many should suffer a sligl
one should perish so horribly. But the question is n
when there is only suspicion of madness in the anim
sound policy would dictate the operation, should th
ground of probability in its favour.

Thirdly, how is the removal of the bitten part to
best by the knife. The surface should be thorough
itself, as far as practicable, so that not a particle of
main. The whole surface of the wound should then
tional security, a stick of lunar caustic should afterwa
to every part of the cut surface. After this, nothin
ings are necessary. But there are cases in which tl
into effect. The wound may be so lacerated, or ma
a structure, as to render impossible the complete se
the knife. Here, if the limb is small and of little
tation may be recommended, as of one of the finger
an important member is concerned, the case should
tient, and he should be allowed to choose between tl
his limb, and the chance of losing his life. Should
risk, it should be diminished as much as possible by
and thorough washings of the wound by means of
or chlorinated water, with the use, in the interval
hausted by means of a pump. This should be plac
hope that the poison may be eliminated with the
be applied to the surfaces as far as they can be reach
tion whether the mineral acids or other liquid caus
bly used, in order to penetrate depths or sinuositie
to a solid stick. Lastly, repeated blisterings may b
so as to establish suppuration, and favour the elimin
this, should premonitory evidences of an approach
be given by the alterations already referred to in tl
putation should be recommended.*

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* The most authoritative French writers recommend th
their estimation being reliable but iron heated to redness.
seem to have the power of destroying the poison. (Note to

in motion, snaps at other animals when they meet him, and sometimes seems to seek occasion to attack them. It is only when fatigued that his tail falls between his legs. Occasionally he appears to have visual illusions, acting as if he saw objects which have no existence. At length symptoms of paralysis appear; the under jaw becomes powerless; the legs give way; the animal totters and falls; and usually dies on the fourth, fifth, or sixth day, with or without slight convulsions. Mad dogs are not subject to convulsive epileptic fits during the course of the disease. Dissection shows nothing remarkable, except the presence of a great quantity of heterogeneous matters in the stomach, which the animal has swallowed, and, in the absence of these, a dark chocolate or coffee-coloured liquid.

A dog supposed to be mad, instead of being chased and killed, after having bitten human subjects, should be caught and confined if possible, so that the question may be decided whether he was really affected with the disease. If, notwithstanding that he receives wholesome food and drink, he should die in a few days, the suspicion would be confirmed; and the requisite measures for safety on the part of the individuals bitten might be resorted to. Should he recover, a great source of anxiety would be removed.

The period of incubation in the dog is shorter than in man. It is, however, differently stated by writers, one author fixing its furthest ordinary limits at eight or nine days, and another extending them to forty days.*

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* In a disease so terrific in its nature, and so extremely fatal, it is of the greatest importance to have at our command all the facts which can in any degree aid in its prevention. With this view I insert, from various sources, the following remarks in reference to the dog in its relation with the disease.

M. Renault reports the following results of his experiments on dogs during a period of 24 years. Of 131 dogs either repeatedly bitten by mad dogs, or inoculated with saliva taken immediately from a diseased animal, 68 were sooner or later attacked with rabies, while 63 had presented no signs of it at the end of a period of four months, during which they were kept under observation. Of those which became diseased, 81 were attacked after the 40th day, and none after the 118th. From this it might be inferred that an animal, which had been bitten, might be safely let loose after a confinement of four months, if not attacked with the disease before that period; but there might still be some hazard; and a safer plan is to kill at once any animal which may have been bitten by another affected with hydrophobia. (*Arch. Gén.*, Mars, 1863, p. 365.)

The probability is that the disease never originates, at this time, spontaneously in the dog, but always from the poison of another animal; though cases have been adduced by M. Bouley which render the statement uncertain. There is no doubt, however, that, in the vast majority of cases, the dog receives it from other dogs; and there is some chance, if not of eradicating the disease, at least of greatly diminishing its prevalence, by depriving the animal of the power of biting by muzzling or other method. It is asserted that, in Berlin, where from 1845 to 1858, no less than 278 mad animals were taken to the hospitals of the town, only 4 were known to be affected with the disease in 1854, when the plan of muzzling began to be in operation, and none at all from 1857 to 1861, when it was in full operation.

In the text I have given the ordinary signs of the disease in the dog by which it may be recognized; but there are some other points which deserve attention. In the beginning the symptoms are so uncertain that it is a good rule, whenever a dog exhibits evidence of being unwell, to confine and watch him until the nature of his disease shall have made itself evident. The following is the series of symptoms, as given by M. Bonley in a memoir presented to the Academy of Medicine of Paris. The animal is at first disposed to retire, and seeks a resting-place in a corner of the apartment, or under the furniture, or in some spot assigned to him for sleeping. He is not now disposed to bite; if called, obeys, though slowly and as it were reluctantly; and lies curled up with his head between his chest and fore-legs. Soon, however, he becomes restless, and often changes his position. He has now a strange expression of face, and a gloomy and suspicious attitude; but his affection for his master seems rather to increase than diminish, and, though he will bite, if excited, generally spares those he loves. At the end of a day or two, he appears to be delirious, and affected with hallucinations; showing by his attitude that he sees imaginary objects, and hears imaginary sounds. Sometimes, after remaining quiet and attentive, he will suddenly dart forward and bite as if attacking another dog, or hurl himself barking against a wall, as if provoked by sights or sounds

Nature.—Little need be said on this subject; for almost nothing is known. No lesion has been discovered which can satisfactorily explain the phenomena. A poison seems to pervade the system, which first deranges, and then annihilates the nervous power. Everything else is mere conjecture.

Diagnosis.—Tetanus is said somewhat to resemble hydrophobia; but it is chiefly in the difficulty of swallowing liquids. In tetanus, however, there is not usually the insane hydrophobic dread of water. The spasms in hydro-

beyond. Yet he is still capable of being soothed with caresses and kind words, and will for a moment remain quiet, when his eyes close slowly, his head hangs, and his limbs seem feeble, as if they must fail beneath him. It is now hazardous to handle or approach him too closely, as he sometimes suddenly rouses himself, looks around with a savage expression, barks at some imaginary object, and, if confined, darts forward the length of his chain, as if in pursuit of an enemy. Sometimes the eyes become sparkling, and seem like two globes of fire. He now becomes still more restless, and, though not yet aggressive, and even perhaps affectionate, he cannot be safely trusted. He has no fear of water, laps and swallows it in the early stage; and, even when constriction of the throat prevents his swallowing, will attempt to drink. A striking and characteristic symptom at this stage, is a disposition to seize, tear, or grind with his teeth, and swallow all kinds of objects, such as straw, the wool of cushions, curtains, carpets, slippers, stones, bits of glass, excrement, &c. Though there is often an excess of saliva, it is not always so; and sometimes the mouth is dry, and in the last stages of a violet colour. He often puts his paws to his mouth as if something unusual were there. The owner should be cautious not to be led to make search in the mouth, as death has resulted from such an attempt. Occasionally there is hemorrhage from the stomach in consequence of wounds from objects swallowed.

The bark is altogether peculiar, and entirely different from that of health. It is in fact one of the most characteristic symptoms. It is hoarser, lower-toned, and though at first sent forth with full throat, is immediately followed by a series of three or four decreasing howls, during which the jaws only partially approach, instead of closing as in the natural bark.

Another sign is that the dog remains mute under all kinds of suffering inflicted on him.

The sight of another dog gives rise to great excitement; so that this may sometimes be used advantageously as a test. All other mad animals experience the same feeling at the sight of a dog, becoming exasperated and furious, and attacking him with whatever natural weapon they may be furnished with, as the horse with his feet and teeth, the ox with his horns, and even the timid sheep, which butts him with his head. No sign is more suspicious than for a dog to become aggressive towards his own species.

There is another important peculiarity, a knowledge of which may save life. It often happens that the dog in the beginning disappears from the house, seemingly as if conscious that he might do mischief. Sometimes he then withdraws to a retired spot to die; but in other instances he returns to his home again; and now is a time of danger. The master, seeing him with marks of suffering, perhaps covered with bloody foam, is naturally inclined to approach and comfort him. But he who makes such a mistake is in great danger. The disposition to bite has now become irresistible, and the animal may seize with his teeth the hand held out to caress him.

When fully mad and furious, the face of the dog becomes terrific. His eyes glare with a fearful light; at the least excitement he darts towards you furiously, sending forth his characteristic howl; seizes the bars with his teeth, which he breaks against the hard iron; and bites at every object before him. To this excitement a profound languor succeeds, he retires exhausted to his nook, and remains insensible to all attempts to irritate him. Again, however, he awakes, and bounds forward with a new access of violence. In this condition, another dog, of either sex, presented to him, appears to excite his venereal propensities, and instead of attacking, he approaches and for a time caresses the stranger; but soon this passes, and the aggressive fury seizes him again; and this alternation may be experienced more than once.

If free, he starts forward, attacking everything living that he encounters on his way, but especially his own species, so that it sometimes happens that a man is protected by the company of a dog. After a time he becomes exhausted, his limbs begin to fail, his gait becomes slow and unsteady, his tail hangs and his head bends downward, and his tongue lolls out of his open mouth, bluish coloured and covered with dust. He is now much less to be feared. He may not go out of his way, but will still bite those who encounter him. At last he drops down in some hollow of the road or field, and remains for hours asleep. But it is most unfortunate for any one who thoughtlessly attempts to rouse him; for even in this state he often has strength enough to bite once more. The disease always ends in paralysis. (*Journ. de Pharm.*, 3e sér., xiv. p. 76.)—*Note to the sixth edition.*

phobia are brief or clonic, those of tetanus generally rigid, lasting, or tonic. The jaw is not set, nor the trunk rigid in the former complaint as in the latter. There is greater disorder of the circulation, of the digestive organs, and of the mental functions in hydrophobia; and tetanus, though it may be attended with a profuse secretion of mucus or saliva, does not present the characteristic hydrophobic manner of excreting those fluids.

It has before been stated that hydrophobia is sometimes imitated by hysteria, or analogous nervous disorders, the result of fright, or other profound impression on the nervous system. Such cases, however, are rare; and the general sagacity of the practitioner must be relied on for detecting the counterfeit. He will always be much aided by the absence of any knowledge, on the part of the patient, of having been bitten by an inferior animal within eighteen months or two years.

Prognosis.—This may be considered as uniformly unfavourable. The cases of cure now and then recorded are so exceedingly rare, and the means said to have proved efficacious have so uniformly failed when employed in other cases, that they must be looked on as at best doubtful. The practitioner may have been deceived as to the nature of the complaint. It is possible that symptoms analogous to hydrophobia may be induced by terror after a bite from a mad dog, though really none of the poison may have entered the system. The probability of this is quite equal to that of a cure of genuine hydrophobia. Certainly no cure that I have seen or heard of has taken place, within the sphere of my personal observation, in an undoubted case of the disease.*

Treatment.—The whole magazine of therapeutics has been exhausted, and vainly exhausted, in the treatment of hydrophobia. Remedies the most violent have been used unsparingly; and practitioners have not been deterred by the apparent inertness of any medicament from giving it a full trial. Bleeding in every degree, mercury, opium and other cerebral stimulants, chloroform, tobacco, lobelia, and all other nervous sedatives, the acids and alkalies, oil of turpentine, cantharides, white hellebore, cevadilla, the salts of lead and those of iron, nitrous oxide inhalation, the injection of warm water and narcotics into the veins, electricity and galvanism, the hot vapour and hot air bath, even the poison of the viper, have all been employed, and with the same sad result. The practitioner is, therefore, left to his own judgment. I do not pretend to recommend any course of treatment, where I can adduce neither experience, nor sound therapeutical principles in its support.

But happily an effectual prophylactic treatment seems to be in our power. To remove completely the nidus of the poison, before the period of incubation is passed, is a measure dictated at once by reason and experience. There is scarcely a case on record, where this measure has been thoroughly carried out at an early period, in which it has not proved successful. Numerous internal prophylactics have been recommended, and enjoyed a short-lived popularity; but all have proved ineffectual upon repeated trials. The source of error in these cases is the circumstance, that of persons bitten a portion only are affected with the disease; and any inert substance which the exempt individuals may happen to have taken acquires the reputation of a preventive anemic; and the patient may be subject to rheumatism or gout, or affected with dyspepsia, amenorrhœa, or anomalous nervous disorder of the respiratory, circulatory, and reproductive functions; and all these abnormal conditions may have some bearing on the complaint.

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* In the *American Journal of Medical Sciences* (Jan. 1860, p. 96), a case is recorded by Dr. E. H. Ligget, of Middleburg, Maryland, in which a cure of a supposed case of hydrophobia was effected by bleeding to 36 ounces, and the use of calomel in doses of a drachm repeated at intervals of four, six, or eight hours until the mouth was affected. The patient was a coloured girl, of about twenty years, who had been snapped at about two weeks before the attack by a dog supposed to be mad, and said that she had been bitten in the toe so as to draw blood. The symptoms were certainly very closely analogous to those of hydrophobia; but it is possible that they may have been hysterical; and the practice employed cannot, therefore, be admitted as sufficient to cure hydrophobia until similar success shall have followed its use in undoubted cases of the disease. (*Note to the sixth edition.*)

The duration of the disease is quite indefinite. The patient may have only one attack, which may last more or less continuously for minutes, hours, days, weeks, or months; or he may be liable to recurring attacks for a number of years, or during his whole life. It is seldom, however, that the disease occurs but once. Much more frequently the patient continues more or less subject to it so long as he lives. In the latter case, the recurring attacks may be distant, comparatively mild, or in a greater or less degree under the control of remedies; or they may increase in duration, violence, and frequency, until at length the patient scarcely experiences any exemption, and life becomes a protracted torture. Death very seldom occurs directly from neuralgia; but the pain may, by its severity and persistence, so far undermine the health as to prove indirectly fatal, by causing the system to sink under diseases which it might otherwise surmount. In some instances, death is welcomed as an escape from insupportable misery, and it has not unfrequently happened that relief has been sought in suicide.

Seats of Neuralgia.—It has been already stated that the disease may attack any part of the body where there are nerves. But all parts are not equally susceptible; and in certain positions it is so common, or so peculiar, as to have received distinct designations. The neuralgic affections of various internal organs have been noticed, in previous parts of this work, in connection with other diseases of the same parts; as of the heart, under the name of *angina pectoris;* of the stomach, under that of *gastralgia;* of the intestines, under that of *neuralgic colic;* and of the urinary organs, under that of *nephralgia.* It has been noticed also as occurring in the encephalon, and in the liver. At present I wish merely to call attention to some of its more prominent external seats. It sometimes appears to affect the skin exclusively, but is more frequently seated in the subcutaneous nerves.

Perhaps in no part of the body does the affection occur so often as in the head. In the scalp it may be confined to one limited spot, or may extend over one-half of its surface. In the latter case, it is denominated *hemicrania.* The affection which goes by that name is sometimes cerebral, and appears to be connected with the stomach, as one of the forms of sick-headache. But it is often, and perhaps most frequently, nothing more than neuralgia of the scalp. When of this character, it is exceedingly painful, and sometimes of considerable duration. I have known it almost incessant for several weeks. In the face, the disease, in its most violent form, has been called *tic douloureux.* It may affect especially certain regions of the face, as the neighbourhood of the eye; the temporal region; the cheek, lips, and alæ nasi; and the dental arches; following apparently the ramification of one of the branches of the fifth pair of nerves; or it may shoot from one part to the other with an impartial violence, as if proceeding from some common source. It is not unfrequent in and about the eye, producing redness of the lids and of the conjunctiva, occasionally swelling of the external parts, and a copious flow of tears. Sometimes the eyeball is peculiarly affected; and then there is excessive susceptibility of the organ, so that the least ray of light produces exquisite pain; and I have known a patient to complain of intense and painful brightness, though the shutters were closed, and the apartment perfectly dark to ordinary vision. This painful sensibility of the eye may be acute and temporary, or chronic; and, in the latter case, sometimes continues for many years, bidding defiance to treatment. When the disease attacks the jaws, it produces one of the most painful varieties of toothache. The tongue, fauces, and mucous membrane of the nostrils are liable to be severely affected. In the throat, the disease sometimes imitates angina, and in the nostrils coryza. *Otalgia* or *earache* is another form of it. This is apt to occur in children, and is often exquisitely painful. It may be confined to the ear, or may radiate to the temples and the cheeks; and is usually accompanied with some disorder of hearing, as excessive sensitiveness, partial deafness, or abnormal sounds.

The disease is not common in the neck. In the upper extremities, though it may occur in any part, it seizes preferably upon the forearm; and one of the most obstinate cases that I have met with was in this position. It was in a man about thirty years of age; and, after having resisted all the means, whether local or general, that could be thought of, yielded at last to a residence of one year abroad.

Neuralgia occurs in different parts of the trunk. It is not uncommon in the intercostal spaces, and in the lumbar region. In the walls of the chest, it is said to occur most frequently between the sixth and ninth ribs, on the left side, and especially in females, in connection with uterine disorder. In the female mamma it is sometimes very violent. When originating in the small of the back, it occasionally shoots forward and downward to the groin, and into the scrotum and labia pudendi. The anus and the genitals in both sexes are sometimes affected with great severity; and the coccyx is occasionally the special seat of the disease.

Next to the head, the lower extremities are probably most frequently attacked. The disease sometimes pursues the course of the crural or femoral nerve, along the inner and anterior part of the thigh and leg, down to the top of the foot. But much more frequently it occupies the sciatic nerve or its branches, constituting a variety of the affection so well known under the name of *sciatica*, and so notorious for its obstinacy. This is characterized by irregular pains about the hip, more particularly between the great trochanter and the ischium, spreading thence into neighbouring parts, and extending downward upon the outside and back of the thigh to the leg and foot; or the pains may begin below and shoot upwards; or they may occupy distinct and isolated spots in this long course, sometimes in one part of the limb, and sometimes in another, as the knee joint, the calf of the leg, and the sole of the foot. I have known neuralgia to be exceedingly violent and obstinate in the knee, imitating inflammation of the joint, though more painful, and, after a long and ineffectual antiphlogistic treatment, including confinement to bed, yielding at length completely to the subcarbonate of iron and narcotics. The patient was a middle-aged negro man.

Anatomical Characters.—The evidence afforded by dissection as to the nature of the disease is of a negative character. It is true that, in some cases of apparent neuralgic pains, signs of inflammation or other source of irritation have been detected in the course of the nervous trunk, or within the spinal canal or cranium; but in others nothing whatever of an abnormal character could be found; and the necessary inference is, that, so far as anatomical evidence goes, neuralgia may exist independently of any structural derangement, and that it is essentially a functional disease.

Causes.—There is not less diversity upon this than upon other points connected with neuralgia. In reference to its etiology, this affection may be regarded in two lights; as originating, namely, in some other morbid affection local or general, beyond the seat of the pain, or as dependent upon some modification in the nerves of the part immediately affected. In either case, it is nothing more than a symptom of the real pathological condition; for a mere sensation cannot be a disease in the strict sense of the term.

In searching beyond the seat of pain for its true source, we may trace it either to some disordered state of the nervous trunk from which the part may be supplied with nervous tissue, to the centres of nervous influence in the spinal marrow, brain, or ganglia, to some organ with which the part may be sympathetically connected, or to the condition of the system, including that of the blood.

In relation to the nervous trunk, the condition may be inflammation, in which case the disease comes under the head of *neuritis;* or it may be irritation produced by various causes, such as tumours pressing on the nerve from without, or originating in its own substance; roughness of a bony surface with which the nerve may be in contact, as when it passes through an osseous canal; or any foreign body lodged in the vicinity of the nerve. It is possible that rheumatism or gout may affect some portion of a nervous trunk, and cause it to radiate neuralgic pain to those parts in which it ramifies. In every case of neuralgia, therefore, it is important to investigate, as far as possible, the condition of the main nerve proceeding from the seat of pain towards the nervous centres. If this be found peculiarly sensitive to pressure in any part of its course, or if any abnormal condition can be detected which may serve as a cause of irritation to it, we may consider that we have advanced at least one step towards tracing the affection to its source.

M. Valleix attached much importance to the detection of these tender spots in the course of the nerve, as indicating the proper position for the application of remedies. He indicated four positions in which they are most likely to be found; 1. near the exit of the nerve from a bony canal; 2. after traversing muscles to ramify; 3. where the terminal branch ramifies in the integuments; and 4. where the nervous trunk approaches nearest the surface.

It is very certain that neuralgic pains of the trunk and extremities often originate in a morbid state of the spinal column. In every case of the kind, the condition of the spine should be carefully examined. Tenderness on pressure will often be found, and we shall be enabled quickly to remove the complaint by attacking it in its source.

Very obstinate cases of neuralgia have sometimes been traced to tumours or other disease within the cranium; but, in such instances, there are generally other obvious effects of a still more serious character, so that the pain ceases to be regarded in any other light than as a mere symptom.

Neuralgia often originates in diseases of distant organs. In some instances, possibly, an irritation may be transmitted directly from the diseased organ through nervous cords connecting it with the painful part; but generally, if not universally, it is through the brain, or other nervous centre, that the communication is effected. The stomach, bowels, liver, urinary organs, and genital apparatus, and especially the uterus, are very apt thus to make their disorder known. Acid or acrid secretions, or some offending article of diet or drink in the stomach, not unfrequently occasion severe neuralgic pains in distant parts of the body. I am confident that I have witnessed such pains in the extremities and external parts of the trunk, connected with organic disease of the liver and kidneys. Indeed, I look upon violent neuralgia, occurring for the first time in a person advanced in life, and resisting obstinately the ordinary means of relief, as always a very suspicious symptom. It has been more than once within my experience the immediate precursor, or rather the first obvious sign of Bright's disease of the kidneys, and cirrhosis of the liver. Milder and curable derangements of these two viscera may also occasion neuralgic attacks, which will give way with their cause. The correction of functional disease of the liver has often led to the relief of such affections. It is not improbable that external neuralgic affections, connected with disease of the liver and kidneys, may be owing as much to the impure state of the blood consequent upon deficiency in the eliminating function of those glands, as to a sympathetic nervous communication; though the latter is no doubt also a frequent source, as in the example of the pain in the shoulder attendant on hepatitis, and of pain shooting down the thighs in nephritis. Impurities in the blood may act by irritating or otherwise disturbing the nervous centres, trunks, or ramifications. The uterus, in disease, is notorious as the source of external pains. From these facts the importance may be understood of directing attention, in cases of neuralgia, to the condition of all the great internal viscera.

The condition of the system has also been mentioned as contributing to the production of neuralgic pains. A gouty or rheumatic diathesis strongly predisposes to them, and I have before expressed my conviction, that much of the neuralgia now so prevalent is merely gout and rheumatism in the nervous form. (See *Nervous Gout*, i. 583.) Reference has been made above to the state of the blood connected with disease of the great internal glands, as a probable source of neuralgia. It is very probable that blood diseased from other causes may have the same effect. Thus, malarial influence is believed to be a cause of neuralgia, and very probably acts through the blood. Many suppose that rheumatism and gout operate in a similar manner, through some special *materies morbi* in the circulation; but this opinion must, in the present state of our knowledge, be regarded as conjectural. A case is on record in which very obstinate neuralgia was ascribed to the long-continued use of arsenic. (*Med. T. & Gaz.*, July, 1858, p. 21.)

Another state of system disposing to neuralgic attacks is debility. The affection is a frequent attendant upon convalescence from long-continued and exhausting diseases, especially from the idiopathic fevers. The anemic condition is very favourable to it. Chlorotic females are extremely subject to neuralgic pains. How debility or anæmia may produce pain, I have attempted to explain in another place. (See *Functional Diseases of the Brain.*)

As to the state of the nerves, in those cases of neuralgia, if there be such, in which the true pathological condition is limited to the part where the pain is felt, we know absolutely nothing.

Hitherto I have treated rather of the pathological conditions, giving rise to neuralgic pains, than of the proper causes. These are predisposing or exciting. To the former belong such causes as induce general debility, or any other of those derangements which have been enumerated as occasional sources of the affection. Among these may be mentioned, as peculiarly operative, all kinds of exhausting excesses, and especially those having reference to the sexual propensities. The state of system produced by miasmatic influence strongly predisposes to the affection. The nervous temperament is supposed to have a similar effect. It is doubtful whether sex has any special influence. There are peculiarities in the female constitution which predispose it to certain forms of neuralgic disease, especially the rheumatic or gouty, and those originating in the spine; but these are probably balanced by the greater liability of men to the complaint from fatigue, exposure, and intemperance.

Of the exciting causes, the most frequent is probably cold. Exposure to a keen cold air is very apt to bring on the neuralgic paroxysm; and cold and wet conjoined are still more effectual. Fatigue, strong mental emotion, excesses of the table, intemperate drinking, the abuse of tea, coffee, and tobacco, retrocession of gout and rheumatism, and the sudden removal of cutaneous eruptions are exciting causes. So is frequently a wound or bruise. In those predisposed to the affection, a slight local injury very often becomes the centre of afflux for the morbid tendency; and the practitioner is made aware of the existence of the neuralgia by a degree of severity and persistence in the pain, much beyond what the accident alone ought to occasion. Severe headache following contusions of the scalp is well known to surgeons. The same thing may occur in any other part of the body; and I have noticed it especially after slight bruises on the leg.

Nature.—Neuralgia is strictly functional or nervous. Some, it is true, are disposed to consider it the result of inflammation of the nervous tissue or neurilemma; and there is no doubt that pains similar to those of neuralgia do sometimes originate in that condition of the nervous trunk. But, in most instances, there is an absence of all proof of inflammation; and the mode of attack, the sudden onset and sudden departure, the intermittent character of the pain, its occurrence especially in states of debility, the frequent want of tenderness on pressure, the ordinary absence of fever, and the fact that it is often aggravated by depletion, and cured by tonics and stimulants, are sufficient evidences that it is not inflammatory.*

Treatment.—A vast diversity of remedies have been used in the treatment of neuralgia, and most of them with some apparent success. Being a purely nervous affection, it might be expected to be influenced by means calculated to make an impression on the mind. The brain, when strongly preoccupied, is less sensible to disturbing causes of all kinds; and, by directing the current of nervous excitement from the seat of disease towards that of intellect and emotion, a powerful revulsive influence is exercised. Engage, therefore, the faith, the fears, the wishes, the attention, or any other mental function of the patient strongly, and relief will be apt to follow. Hence the occasional efficacy of metallic tractors, of magnetized rings, of homœopathic pills, and of numberless scarcely less inert applications. An illustration familiar to every one is the temporary cure of toothache upon the approach of the dentist. Even really efficacious means are frequently very much aided by the co-operation of mental influence; and the physician who can most strongly bring this to bear upon the case, will be most likely to obtain at least temporary success. I shall not pretend to enumerate all the remedies which have been recommended in this complaint; but shall be content with stating the principles upon which it appears to me that it should be treated, and the measures that have real efficacy, or considerable pretension.

In the first place, efforts should be made to discover any hidden source of the pain, and to remove it if discovered. If, upon examining any of the nervous trunks proceeding from the affected part, a tender spot should be found, it may be proper to apply leeches once or oftener to the seat of tenderness, and subsequently, if necessary, to effect revulsion by small blisters or other means. Should any mechanical cause of irritation along the course of the nerve be detected, as a tumour, foreign body, spiculum of bone, &c., it should be removed, if possible. If, proceeding to the nervous centres in our investigation, we find disease of the spine or of the brain, we must direct our remedies accordingly;

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* *Tic non douloureux*, or *painless tic.* Under this name, an affection of the face, which though often noticed by practitioners has not hitherto been considered as entitled to a special designation, has been particularly described by M. Debrou, of Orleans, in the *Archives Générales* for June, 1864. It consists of painless spasms of one or more of the muscles of the face; short, quick, jerking, and frequently recurring contractions, analogous to the startings or shootings of the neuralgic affection; and bearing to this the same relation that the facial nerve, or portio dura of the seventh pair, which is exclusively motor, bears to the fifth pair, which is especially sensory; and, as neuralgia of the face is seated in the branches of the latter nerve, so is the tic non douloureux seated in the muscles supplied with the ramifications of the former. The affection may occur in any part of the face, as the lips, eyelids, or cheeks, and may occupy one muscle or several at the same time. In certain cases the spasm is persistent, continuing without relaxation for a considerable time. It may be constitutional in its origin, or local, and dependent on some lesion at the origin or in the course of the facial nerve. In the latter case, a greater degree of the injury which produces the *tic* will give rise to palsy. Sometimes there is reason to believe that it is of rheumatic origin. In certain cases it is extremely obstinate, and yields to no remedies that can be employed, probably because dependent on irremediable injury to the portio dura in its course within the cranial bones. In milder cases, as it depends on the same influences directed to a motor-nerve, which when affecting a sensory nerve, produce pain, it is to be treated on the same principles as neuralgia, except in so far as the remedies may be addressed, in the latter, not to the removal of the disease but merely to the relief of the pain. (*Note to the sixth edition.*)

and violent neuralgia may often be cured by obviating spinal irritation. (See *Spinal Irritation.*) The removal of carious teeth often affords relief in facial neuralgia; and cases are recorded by Dr. Hullihen, of Virginia, in which injections of a solution of nitrate of silver into the antrum, through the socket of an extracted tooth, have cured severe tic douloureux. (*South. Journ. of Med. and Phys. Sci.*, i. 217.)

Next, it will be proper to interrogate the various organic functions, and ascertain whether some disorder in these may not be the source of the mischief. The digestive function especially deserves attention. Dyspepsia, if existing, must be duly treated; and care must be taken to prevent hurtful impressions on the stomach. Acid in the stomach, and flatulence should be corrected, acrid accumulations removed by cathartics or otherwise, and any article of diet that may prove a cause of offence prohibited. Neuralgia may not unfrequently be cured by abstaining from certain kinds of food or drink, or certain luxuries which may have been habitually indulged in. A little watchfulness will enable the patient to detect the particular source of the mischief. It will occasionally be found in the use of strong coffee, tea, tobacco, or alcoholic drinks; and a good general rule, in the treatment of neuralgia, is to abandon all these for a time, until it shall be satisfactorily ascertained that they do not contribute to the disease. The bowels should be attended to, and any disposition to constipation corrected. Sometimes an active purge will be found useful; and, when there is no debility, this may be occasionally repeated. Cures of neuralgia have been effected by croton oil. But in cases of debilitated digestion laxatives should be preferred.

The hepatic function also requires attention. The happiest effects sometimes follow a little blue mass or calomel, or the use of nitromuriatic acid.

In like manner, disease of the kidneys and urinary passages, and of the generative organs, should be cared for; and amenorrhœa especially should be remedied by the requisite means.

Regard must also be had to the condition of the system. If there be a plethoric tendency, which is not common, it may be corrected by a restricted diet, an occasional saline laxative, and exercise. The opposite condition of anæmia is much more common, and frequently demands treatment.

But probably the most frequent of these general sources of neuralgia is the gouty or rheumatic tendency; and cures may often be effected by remedies applied in accordance with this view. The physician should never allow a case of neuralgia to pass from under his observation, without having investigated its possible relation to gout and rheumatism. (See *Nervous Gout.*)

Not unfrequently a close examination will detect a syphilitic origin. Under these circumstances, or when there is only a strong suspicion of the kind, recourse should be had to iodide of potassium in doses of five or ten grains three times a day, and, if this fail, to a gentle mercurial course.

Neuralgia is often intermittent, and, when not so at first, often becomes so. The physician should always be on the watch for this state of the disease; as, by availing himself of the power of antiperiodic remedies, he will almost invariably be able to arrest it. I do not think I have failed, except in one instance, in curing regular intermittent neuralgia, of the quotidian or tertian character, by means of sulphate of quinia. In general, moderate doses of this medicine will answer, say from ten to twenty grains between the paroxysms; but, if these should not succeed, the quantity may be augmented to half a drachm, or a drachm if necessary. Cases which refuse to yield to the smaller quantity will sometimes immediately give way to the larger. The remedy will often also succeed in the regularly remittent variety; and sometimes, after failure at the commencement, will answer the purpose effectually, if tried at a later period. Occasionally a case of neuralgia, commencing in an irregularly continuous form, may be brought to the remittent or intermittent form by treatment addressed to the state of the system.

Arsenic is another antiperiodic remedy, which has often proved effectual in periodical neuralgia; but it is less to be relied on than quinia, and does not so well accord with the condition of system generally attendant on the disease. Nevertheless, it might be tried if quinia should fail, or, from constitutional peculiarities of the patient, be inadmissible.

Other means calculated to interrupt periodical diseases will also occasionally succeed, such as an emetic, opium, a blister, the tourniquet, &c., employed in anticipation of the paroxysm. For a particular account of these, the reader is referred to the subject of *Intermittent Fever*.

But we are not without remedies for pure uncomplicated neuralgia, not periodical in its character. So far as my experience has gone, the most effectual of these is subcarbonate of iron, given in connection with one of the narcotic medicines, especially extract of belladonna. The subcarbonate should be administered in large doses, from half a drachm to a drachm, or even two drachms, three or four times a day. Each dose may be mixed with ten grains of powdered ginger; and care should be taken always to keep the bowels well opened once daily, in order to prevent the injurious accumulation of the medicine. If requisite, this may be effected by the addition of rhubarb to the powder; or by giving separately, as circumstances require, pills of rhubarb and aloes, made a little more active, if necessary, by the addition of one-quarter or one-third of a drop of croton oil. The iron probably acts by improving the blood, and invigorating the nervous system.

Sulphate of quinia will also frequently prove efficacious in this form of neuralgia, though much less to be relied on than in the regularly periodical. It should be given largely. There is one form of the disease, in which I have found it, in connection with oil of valerian, almost uniformly successful; I allude to *hemicrania*. This is an old practice; but, in former times, Peruvian bark was given in substance with the infusion of valerian; and it was difficult to induce the patient to swallow the requisite quantity of the medicine. From ten to thirty grains of the sulphate, and about twenty drops of the oil of valerian, should be given daily, divided into six or eight doses, and persisted in if necessary for a week or more. Enough of the salt of quinia should be given to induce its peculiar effects upon the brain, such as buzzing in the ears, &c. It very often happens that the pain is increased for the first day or two, after which it gradually subsides. The two medicines may be conveniently conjoined in emulsion, to which a little aromatic sulphuric acid may be added to effect solution of the quinia; or the sulphate may be given in pill, and the oil in emulsion.

Besides the chalybeates, various metallic tonics have had some reputation in the treatment of neuralgia. Among them may be mentioned nitrate of silver, the salts of copper, and the sulphate and oxide of zinc. Valerianate of zinc is much esteemed by some practitioners.

Iodide of potassium has been highly recommended. It certainly, in some cases, appears, in doses of from five to ten grains three or four times a day, to act like a charm; but in many other cases it fails entirely; and it is difficult to determine what are the precise circumstances under which it is efficient. It is undoubtedly very useful in syphilitic neuralgia; and pains arising from mercury or lead in the system are supposed to be cured by it, through its eliminating properties; but these are not all the cases in which it acts beneficially. The same remarks are applicable to bromide of potassium, which sometimes operates most happily in neuralgia, without suspicion of syphilitic contamination.

In very obstinate cases it may not be amiss to try the effects of a mild mercurial impression, after failure with other measures. Not to speak of its beneficial influence in syphilitic cases, this remedy is so efficient in the removal of chronic inflammation, and neuralgia is so often connected with some concealed organic affection of the viscera or nervous centres, that some good from it might be reasonably hoped for in the cases alluded to.

Muriate of ammonia, in the dose of half a drachm three or four times a day. has been given with asserted advantage.

Valerianate of ammonia was employed, with extraordinary effect, in some obstinate cases, by M. Declat, of Paris, and others have subsequently given testimony in its favour. The dose is from two to eight grains, which may be given dissolved in water, and repeated twice a day. (See *U. S. Dispensatory.*)

Oil of turpentine is another alterative which has occasionally proved useful, especially in cases connected with the sciatic nerve. It should be given in the dose of half a fluidrachm or a fluidrachm, three times a day Much efficiency has also been claimed for the terebinthinate vapour bath.

The alterative effect of sulphur may be tried with hope of benefit, especially when the case is complicated with rheumatism or gout. The natural sulphur waters have sometimes proved advantageous.

Cod-liver oil may be used conjointly with other remedies, in all chronic cases connected with impaired nutrition, and a defective state of the blood.

A repetition of emetics has occasionally cured obstinate neuralgia. This remedy was recommended by Dr. Physick in those very painful affections of the head, sometimes consequent upon a contusion or wound of the scalp.

The narcotics are almost indispensable in the treatment of the disease. Sometimes they are of themselves adequate to its temporary cure, and at all times are necessary to render the complaint endurable. The most efficient beyond all comparison is opium in one or another of its forms. I generally prefer one of the salts of morphia; but sometimes the black drop or deodorized tincture (*U. S. Ph.*) agrees still better with the patient. The medicine should be given in such doses as may be necessary to procure ease during the most violent paroxysms; but great care should be taken not to increase the dose too rapidly, so as to accustom the system to its effects. It is best to fix some limits which should never be exceeded, except under extraordinary circumstances; and a good rule is, after having used it for some time, to substitute another narcotic for it, so that the system may recover its susceptibility. The great danger in the use of opium is that the patient may contract a pernicious habit, which he may be unable or unwilling to break, when there may be no longer occasion for the medicine. The physician should bear this danger in mind, and regulate his prescription accordingly. I often combine morphia with wine of colchicum, so that much increase in the dose will produce sickness of the stomach, and indispose to a further augmentation. Besides, the effect of the colchicum is itself often beneficial, and in gouty cases generally so.

Should opium disagree with the patient, or circumstances forbid its use, recourse may be had to extract of hemp, or large doses of hyoscyamus or lactucarium as a substitute. I have found considerable advantage from the internal use of chloroform, in neuralgic pains; but it is liable to the objection that it is apt to occasion nausea and vomiting. This is probably owing, in part at least, to its insolubility in water and the fluids of the stomach. When camphor is admissible, and still more when it is indicated, the objection may be obviated by rubbing this substance with chloroform, and suspending the resulting liquid in water, by the intervention of the yolk of eggs. A permanent mixture is thus made, which may be diluted to any desirable extent with water, without the separation of the chloroform.*

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* The following formula will answer the purpose. Take of chloroform fʒij, camphor ʒi, the yolk of one egg, and of water f℥vj. Mix, and direct a tablespoonful to be taken every half hour, every hour, or every two hours, according to the urgency of the case, until relief is obtained, or some decided effects are experienced from the medicines, either on the stomach or the brain. (*Note to the second edition.*)

But opium, and the substitutes for it just mentioned
liative. There are some narcotics, which, with an an
ative influence that appears to be somewhat curative.
expressed my preference for belladonna. Stramonium
Conium is also useful in large doses. The three may
with advantage. They should be given so as to pro
other action on the brain.

The nervous sedatives have also been much used in
joys considerable reputation. I have used it occasi
confess that I have been much more frequently disap
tincture is the best preparation, and should be given
to ten drops, or in such quantities as may be necessa
tingling effects upon the fingers or other parts, or son
head. Tobacco and hydrocyanic acid have sometim
effects of the former may be obtained by smoking it.

Of course, the narcotics are to be given in connecti
nently effective remedies already mentioned.

The nervous stimulants, or antispasmodics, as musk,
lerian, garlic, &c., may sometimes be advantageously
remedies, when, besides mere pain, there may be othe

Local Remedies.—The local treatment of neuralg
may be done in this way to afford relief to the patie
mended are even more numerous than those intern
whole, the most efficacious are the narcotics. *Lauda*
lotion, or in the form of a cataplasm; care being take
rious effects from its absorption, if the cuticle should
preparations of *opium* and *camphor* may sometime
The *strong tincture of aconite* is highly recommende
upon the part till it produces its tingling and ben
mixed with lard, in the form of ointment, in the propor
to a drachm, has been greatly praised; but it is expe
degree superior to the tincture. Ointments made wit
nium and *belladonna* may also be applied by friction.
made according to the officinal directions, and large
especially in neuralgic affections of the scalp, are some
ficial. *Tobacco cataplasms* may be used occasionally
their depressing effect, when too freely or too long
in mind. The same remarks are applicable to *hydro*
of potassium, which have been commended. The
the proportion of one or two grains to the fluidounce
has been employed locally with great benefit. The
for its locally anodyne effect in neuralgia, was, I bel
Philadelphia. The liquid should be applied upon a pie
it, and this should be covered with oiled silk to prev
burning and superficial pain may be experienced at fir
been produced; but the relief of the neuralgic pain is
and lasts for a considerable time. I have experience
more prompt and complete anodyne effects than from
it may be preferably applied mixed with some emollie
of a cataplasm, or rubbed on the part in the state of

When the pains affect the anus, uterus, urinary orga
the anodyne may be most efficiently employed in the
num, under such circumstances, affords speedy relief.

The endermic method is sometimes also highly use
be made in the near vicinity of the pain, the cuticle
of powdered acetate of morphia sprinkled upon the

Still more efficient is the method of hypodermic injection, introduced into notice by Dr. Alexander Wood, of Edinburgh, and now very much and often very advantageously employed. Dr. Wood injected a solution of one of the salts of morphia, particularly the muriate, into the areolar tissue, near the part most tender to the touch. A minute syringe, with a hollow, sharp-pointed needle at the end, having a lateral orifice near its extremity, is used for the purpose; and one-fourth or one-third of a grain of the salt may be injected at once, dissolved in from thirty minims to a fluidrachm of water. Its effects are very speedy, and sometimes permanent; but it is liable to the great inconvenience of often causing distressing nausea and vomiting, like those of sea-sickness. Occasionally also it acts with unexpected efficiency; and it may be best to begin with a smaller dose than the smallest recommended by Dr. Wood, and increase if necessary.

Atropia may be substituted for morphia, when the latter produces too much nausea, or fails by repetition. In 53 cases in which a solution of sulphate of atropia was injected by M. Behier near the point painful on pressure, it relieved all, and cured those in which it was sufficiently repeated. From the fiftieth to the thirtieth of a grain may be used at first, dissolved in 8 or 10 minims of water. (*Arch. Gén.*, Août, 1859, p. 238.)

Ice or *ice-cold water*, locally applied, occasionally affords relief. The same may be said of *steaming with hot vapour*, or the employment of the *hot douche;* and great success has been claimed for the cold douche, employed after perspiration induced by heat. Covering the part with *oiled silk*, and then keeping it warm by a layer of carded wool, probably operates usefully in the same mode as the local vapour bath. *Dry heat*, applied by means of burning coals near the part, and continued as long as the patient can well bear it, is another mode of obtaining ease that may be resorted to.

Rubefacients, such as oil of turpentine, Cayenne pepper, and tincture of cantharides; repeated *blistering* over tender points that may be discovered near the seat of pain; *revulsion* by means of setons, issues, and moxas; the use of *electricity*, *galvanism*, and *electro-magnetism;* and *acupuncture*, are all measures which have strong testimony in their favour, and which undoubtedly often produce a beneficial impression upon the disease. Pustulation, by means of croton oil, over the nervous trunk in the ramifications of which the pain is seated, is said to be sometimes efficacious.*

Indeed, anything which for the time modifies the nervous condition of the part may occasionally afford temporary relief; and I have never known more speedy effects from any remedy, than I have sometimes witnessed from *gentle friction* with a soft hand upon the surface.

In a disease so painful, often so obstinate and so lasting, and in one, too, so much temporarily under the influence of the mind, it is highly desirable that ercise sometimes gives relief, probably by a revulsive influence. On the same principle is explained the relief which is asserted to result from the popular remedy of forcibly compressing a roll of sulphur in the hand until it cracks. Faith, however, or the strong engagement of the attention, has probably quite as much to do with the result. The warm or hot bath may be employed in obstinate cases; and, should the affection not yield to some of the measures mentioned, recourse may be had to any or all of those directed for the neuralgic paroxysms, of which the local application of chloroform would be likely to be among the most efficient. (See *page* 920.)

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* In relation to electro-magnetism as a remedy, there has been some difference of opinion as to the most efficacious method of employing it. M. Duchenne recommends the faradization of the skin, over the part affected (see my Treatise on *Therapeutics and Pharmacology*); and this method is often very effectual; but it sometimes fails, and is asserted to be attended with pain so excessive as to constitute a great objection to it. M. Becquerel recommends that a powerful electric current should be sent through the nerve. As this has the effect of benumbing a nerve in health, it may be expected to render it insensible to the cause of pain in disease. This has been found to be the case. The pain is relieved altogether for a time, and sometimes does not return; and when it does return, a sufficient repetition of the remedy will generally effect a permanent cure. (*Braithwaite's Retrosp.*, No. 42, p. 49.) Dr. J. Althaus advocates the same method. He operates by applying, by means of moistened conductors, one pole to the nerve as near to its centre as possible, and the other over any of the terminal ramifications in the surface. He uses a current of medium intensity, and has found that it occasions only a moderate pain, which is easily supportable. He has found the method successful when faradization of the skin had failed. (*Med. T. & Gaz.*, Aug. 1858, p. 166.)—*Note to the sixth edition.*

To meet the second indication, all obvious derangement of the digestive organs or the system at large should be corrected; and the remedies suitable for gout and rheumatism will often be found beneficial. I am in the habit of employing sulphur, as an alterative, in those cases in which no obvious indication is presented for other treatment. Great advantage is said to have accrued from the use of tar-water. Dr. S. A. Bardsley succeeded, in his own case, in preventing the nightly attacks to which he had been a martyr for many years, by the simple expedient of sleeping on an inclined plane; the foot of the bed being twelve inches lower than the head. (*Lond. Med. Gaz.*, May, 1847.) Should the disease exhibit an obstinate disposition to return, recourse may be had to the remedies which have been found useful in the cure of neuralgia. Persons subject to attacks of cramp should be careful, in swimming, not to venture beyond their depth, or out of the reach of aid, or, what is still better, should avoid the exposure altogether.

Article IV.

HICCOUGH, OR SINGULTUS.

THIS consists of sudden, short, convulsive inspirations, attended with a slight peculiar laryngeal sound, and followed immediately by expiration. The affection is placed in this subsection, with the same doubtful propriety, and for the same reason, as the complaint treated of in the last article.

Hiccough is probably, in almost all instances, the result of some derangement exterior to its apparent seat, and is, therefore, strictly speaking, merely a symptom. But, though frequently an attendant upon obvious diseases, it very often also occurs without being clearly traceable to any other affection, so that it is necessary to consider it in description, as it is in fact often treated practically, as a distinct complaint.

The movements concerned in the production of hiccough are probably a spasmodic contraction of the diaphragm, and a certain degree of constriction in the glottis, which occasions the sound upon inspiration, and limits the amount of air inspired.

Symptoms, Course, and Effects.—The convulsive inspirations are usually productive of some uneasiness about the præcordia, and sometimes painfully agitate the abdominal and thoracic viscera, or even the whole frame. They commonly occur in spells or paroxysms, and succeed each other with some degree of regularity, at intervals of a few seconds. The paroxysm may last only a few minutes, or it may extend to hours, or days; and is in general quite irregular in its recurrence. It is said that the hiccough has been sometimes almost continuous for weeks, or months; and instances are on record in which it has persisted for three or four months with little interruption. A case is reported in the *Journal des Progrès* (xviii. 208), in which a man had been affected with it for four years, and had been reduced so much that his life was despaired of. But such cases are extremely rare. Almost always, whatever may be the duration of the complaint, the patient has more or less respite in its course; and it is very seldom quite continuous through one whole day. Sometimes it is very fugitive, being limited to one or a few brief paroxysms. In general, even in the worst cases that have come under my notice, I have found it to yield speedily to treatment; and I have seldom known it to last longer than a week or ten days.

Though rarely dangerous, it is often exceedingly annoying, and sometimes wearing in its effects upon the health by interfering with the natural rest. Not unfrequently, however, the patient, when exhausted by its long continuance, will sleep through its attacks. It may add to the danger of diseases with which it is associated, and in some instances is asserted to have ended fatally without any other discoverable cause of death. It is probable, however, that there was in these cases some concealed lesion, which was the cause at once of the obstinacy of the hiccough and of its fatal issue.

Like most other nervous affections, this is sometimes regularly intermittent, occurring at a particular hour every day, every other day, or at longer intervals. Some persons are said to be subject to attacks of it once a year, at about the same time.

Causes.—An anemic or otherwise debilitated state of system predisposes to hiccough. The intemperate are very subject to it. The same is said to be the case with pregnant and hysterical women. The young and the old are more frequently affected than persons of middle age. Certain diseases are very apt to be attended with it, especially the phlegmasiæ of the abdominal viscera, in which its occurrence sometimes marks the approach or existence of collapse. The same remark is applicable to malignant diseases in general, in which it is looked on as an unfavourable sign. But it so frequently occurs in the course of diseases which are in no degree violent or dangerous, that little importance need be attached to it as a prognostic symptom.

The slightest causes are often sufficient to induce an attack in the predisposed. Anything which disorders the stomach may have the effect. So great is the influence of this organ in producing hiccough, that for a long time the affection was considered as essentially gastric, and was supposed by many to consist mainly in spasmodic contractions of the stomach. This peculiar influence may be explained by the nervous connection existing between the stomach and the diaphragm through the semilunar ganglia. Among the exciting causes are emptiness and over-distension of the stomach, indigestible or irritating food, draughts of cold water, flatulence, excess in the use of alcoholic drinks, acid and bile in the stomach, worms, any sudden emotion, the passage of urinary or biliary calculi, the disturbance of system following surgical operations, inflammation or irritation of the spinal marrow, nervous derangements in general, the retrocession of cutaneous eruptions, the suppression of wonted discharges, especially the menstrual, and gout or rheumatism acting on the diaphragm or its nervous centres. Habit has probably some influence in sustaining it, and it is thought to be sometimes induced through the agency of the imitative principle.

Treatment.—The remedies should be addressed, first, to the relief of the hiccough, and, secondly, to the prevention of its return.

1. When the affection is slight, it may often be set aside by making a very full inspiration, and then holding the breath as long as possible, so as to keep the diaphragm in a state of voluntary contraction; and this process should be repeated until the disposition to a return of the hiccough is observed to cease. Another mechanical measure, said to be sometimes effectual, is strong pressure upon the epigastrium, or upon one or both clavicles at their inner extremity. A fit of sneezing, and the act of vomiting probably operate partly in the same way in its relief. Sudden impressions, whether bodily or mental, will often

suspend the paroxysm; even though of the same nature with those which may, under other circumstances, induce it. A very common mode of cure is to cause sudden alarm, anger, or surprise. The same effect results from strongly engaging the attention in any way. A draught of cold water will sometimes give relief. Dupuytren succeeded in a very obstinate case by applying the actual cautery to the epigastrium.

In cases in any degree obstinate, the nervous or cerebral stimulants may be resorted to, such as musk, assafetida, aromatic spirit of ammonia, camphor, opium, &c. I have on the whole found nothing so effectual as musk. This, when of good quality, will almost always check hiccough, and very frequently effect a permanent cure. It is especially adapted to it, when occurring in low febrile diseases; but may be employed in all obstinate cases, when not contraindicated by the state of the system. A combination of chloroform with camphor sometimes also acts very promptly and efficiently. Various other remedies have been found occasionally useful, among which are sharp vinegar and sulphuric acid. The latter of these substances has proved promptly effectual in a case which had resisted other treatment for a very long time.

2. To prevent the return of the paroxysm, sulphate of quinia is the most effectual remedy in the regularly intermittent cases. Given in the dose of twelve grains daily for three days, it has effected the cure of a very obstinate case, not periodical. In general, it is proper to consult the state of the system, and treat the patient accordingly. Debility, anæmia, general nervous disorder, amenorrhœa, gastric flatulence and acidity, excessive abstinence, repletion of stomach, dyspepsia, constipation, &c. are to be corrected by measures pointed out elsewhere. Combinations of the bitter tonics, chalybeates, antispasmodics, laxatives, and carminatives will often be found useful. The same may be said of cold bathing, pure air, exercise, and a proper regulation of the diet. It is asserted that bleeding has proved of advantage in some instances in which the complaint has been connected with plethora. When of gouty or rheumatic origin, it may be treated in the same manner as other nervous affections of a similar character. The spine should be examined, and, if found tender, treated as directed for spinal irritation.

Article V.

LOCOMOTOR-ATAXY.

Syn.—*Progressive Locomotive Ataxy.*—*L'Ataxie Locomotrice Progressive* (Duchenne)

We place this affection provisionally among the diseases of the nerves, until a further examination shall have determined its proper place in a nosological arrangement. I am, however, disposed to think, for reasons which will be seen in the course of this article, that it is essentially a spinal affection. Though not a new disease, it has but recently been accurately distinguished from various other complaints with which it had been previously confounded. To M. Duchenne, of Boulogne, belongs the credit of having first accurately described it, and proved its claims to be considered as a distinct disease. The name of *progressive locomotive ataxy*, conferred upon it by that eminent pathologist, though rather unwieldy, better expresses its character than any other which has been suggested; but, in adopting it, I have taken the liberty of somewhat modifying it, and dropping the prefix progressive, as unnecessary. The essential character of the disease is the loss of the power of associating, or co-ordinating the muscular movements for the accomplishment of any given purpose; the muscles themselves individually retaining all their normal powers unimpaired. It has usually ranked among paralytic diseases; because, the ordinary ends of muscular action being unattainable, it has been inferred without due examination that the muscles themselves were in fault. Other morbid conditions are so frequently associated with the simple loss of the co-ordinating power, that they have been considered by M. Duchenne as constituting parts of his disease. Such are certain derangements of the visual apparatus, and pains of a peculiar character, which are carefully described by him as characteristic symptoms; but the fact appears to be, that, though almost universally present at one or another period in the progress of the complaint, they are not positively essential constituents, as one or the other may be absent without affecting its character; and cases have occurred in which the loss of the co-ordinating power has existed without either of them.*

Symptoms.

It will be most convenient first to present the features of a characteristic case, as they successively offer themselves, and afterwards to treat of the several symptoms distinctly, and endeavour to estimate their relative value.

A patient first, perhaps, observes some abnormal condition of the eye, as double vision with strabismus, or a falling of the upper lid, and with them a slight feebleness of vision. These may be the only symptoms of disordered health discoverable. But either simultaneously, or at some subsequent period, he becomes affected with violent pains, of a peculiar character, occurring paroxysmally, in various parts of the body, as in the foot, the calf, the thigh, or some portion of the trunk. These phenomena, very slight at first, may disappear for a time, and not recur for months, or even for a year or more; but on their recurrence they are more severe; and, though again perhaps disappearing, or at least much remitting, they return at shorter intervals, and with increasing severity; continuing in this variable condition often for years, and sometimes many years, before the disease is completely formed. In the progress of the complaint, at various periods, perhaps near the beginning, perhaps not till the lapse of years from the first noticed symptom, the patient experiences abnormal sensations in his feet or hands, as of numbness, formication, or of tingling, with diminished tactile sensibility. These symptoms extend, and in a short time some disorder of movement is experienced. The patient finds that he walks with difficulty, feels uncertain upon his feet, and loses confidence in his powers of regulating his movements. Perhaps, instead of the lower limbs, the upper are affected, and he can no longer execute the most ordinary movements with facility. He finds difficulty, for instance, in conveying food to the mouth; and the attempt to carry a glass to the lips is attended with zigzag movements of the arms, and at last fails entirely. The cutaneous insensibility and derangement of movement increase. The patient, in walking on a hard surface, as of stone or wood, feels as if he were treading on something soft, as upon wool, or down, or a thick carpet. With unimpaired vision, and in daylight, he can move with greater precision, as he is enabled to supply the place of feeling by the aid of sight. With occasional ameliorations, and sometimes long remissions, the associated symptoms on the whole gradually increase; the sight becomes more and more feeble, and may be lost entirely; the sufferings are often excruciating from the intense severity and frequent recurrence of the pains; and the imperfection of movement, at first perhaps confined to one leg or one arm, becomes generalized, and the patient loses all command over his motions. Unable to stand, or walk, sometimes even to sit, he is confined wholly to the bed, and in some instances can scarcely turn himself as he lies. Sleep is interfered with by the pains; the stomach and bowels become disordered and the appetite fails; either constipation of the bowels and retention of urine or incontinence in both functions comes on, depending the former on paralysis of the rectum or bladder, the latter on the same condition of the sphincter; and life at length yields to the wearing effects of the disease, or perhaps more frequently to some intercurrent affection which the reduced strength of the system cannot resist.

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* So early as 1857, M. Duchenne communicated his views of the nature of this complaint to the Paris Society of Medicine; but a more full account of it was given by him in a memoir, commenced in the *Archives Générales* for December, 1858 (p. 641), and continued to its completion in subsequent numbers of that journal. His description of the disease, presented in this memoir, was so full and accurate as to leave little else for subsequent writers to do but to confirm his statements. Other observers, however, have contributed new facts in reference to the pathology and treatment of the affection. M. Trousseau soon recognized the disease, and treated of it in his clinical lectures. M. Jules Lecoq, of the French Marine, published an account of some cases, mainly confirmatory of the statements of M. Duchenne, in the *Archives* for June, 1861 (p. 689); and in a subsequent number of the same journal (Nov. 1861, p. 513) M. H. Bourdon, of Paris, gave the results of a post-mortem examination, in which the anatomical characters of the disease were first accurately presented. The records of a case which proved fatal in the Hospital Lariboisière, at Paris, were published by Dr. Oulmont, in which the same anatomical characters were found essentially as in the case of M. Bourdon. (*Ibid.*, Avril, 1863, p. 484.) These were further investigated by Virchow, Rokitansky, Leyden, and Friedrich, in Germany. (*B. & F. Medico-chir. Rev.*, July, 1865, p. 49.) The English pathologists afterwards took up the subject, and papers in relation to it were published by Dr. J. R. Ramskill, of London (*Lancet*, May 6, 1865), Drs. J. Lockhart Clarke and J. Hughlings Jackson (*Ibid.*, June 10, 1865), and Dr. Julius Althaus (*Ibid.*, Dec. 30, 1865); and cases have been recently described by Dr. A. Keith and Mr. Galloway, in the *Times and Gazette* (Jan. 1866, p. 64). From these sources, and some others to which reference is made in the text, the materials were derived from which the above article has been framed.

The above is a rapid sketch of the disease, and leaves much to be explained, which can be best done by considering the several symptoms, or at least those which are most characteristic, separately.

1. *Loss of co-ordination.*—The most striking peculiarity of the disease is the derangement of the function of muscular co-ordination, contrasted with the almost perfect integrity of the muscles themselves. Instead of wasting, as in paralysis, the muscle retains its volume and firmness; and when its force is measured by an instrument, it is found to be little or not at all impaired. Thus the patient, unable to stand, will often project his foot with great force against neighbouring objects; and, without the capacity to regulate the arm, will sometimes strike a glass against his teeth with force enough to break it. Before being confined to bed, he is apt to be affected while upon his feet with dizziness, and a feeling as if he should lose his balance, especially on turning his head backward. I have referred before to the feeling of the softness of objects trod upon, in consequence of the diminished tactile sensibility in the sole of the foot. Sometimes the feeling is as of treading on elastic bodies, and sometimes as if the body were impelled forward by an invisible force. In walking, one of the limbs is often projected forward with great force beyond the due limits, or the foot is impelled forcibly on the ground; and these abnormal motions are sometimes so violent and sudden, that the patient falls. The arm of an assistant then becomes necessary in walking; and, even in standing, the support of neighbouring objects is requisite. When he attempts any special movement, the limbs are violently agitated in consequence of the obedience of each muscle to the will; but they will not combine to effect the desired end, and execute only motiveless, or as it were whimsical gestures. Though so little is accomplished, the patient is exhausted by the muscular effort; while, if lying, he may exert great force with a single limb without any sense of fatigue.

The trouble generally begins in one of the lower extremities. When extended to the upper, the fact is almost always made known by numbness or tingling in the little and ring fingers of one hand. In twenty cases, only one exception to this rule was noticed by M. Duchenne; and in that the sensations were felt in the fingers supplied by the median nerve. In time, however, the sensation extends to the other hand and the other fingers, still remaining most prominent in those first affected. The numbness is followed by decided diminution of the tactile sensibility; and this by the loss of the co-ordinating power, so that the hand ceases to be able to perform its proper offices with precision. The same discord in the motions extends to all the muscles of the arm, which in its turn loses its executive power.

In explaining the loss of due association of movement, M. Duchenne calls attention to two influences which are necessary to normal co-ordination; one, which he calls the harmony of antagonists; the other, instinctive or voluntary association. 1. An idea has prevailed that, in the antagonistic muscles, the flexors and extensors for example, when one set is called into action, the others are entirely quiescent. But the contrary of this is true. When the muscles necessary to a certain motion are made to act, the antagonist muscles also always contract, though in a less degree. This is necessary to prevent excess of action in the first set, and without it there would be no possibility of their being properly regulated. Thus in walking, the muscles that extend the leg, unless counteracted by the flexors, would send it forward beyond the proper line, and precision of movement would be impossible. 2. Isolated muscular action does not exist in health. There is no movement which does not require the consent of different muscles to accomplish it. Now, an impairment of either of these influences would necessarily interfere with precision of movement. The antagonistic muscles do not act duly, and hence motion under the will exceeds the intention; as when the leg is pushed forward in walking, or the hand driven strongly against the lips when the wish is simply to approach them. It requires no illustration to prove that the loss of the instinctive association of muscles must lead to the same disturbance of co-ordination, and it is probable that both these influences are disturbed in the disease.

2. *Anæsthesia.*—Troubles in co-ordination have often been noticed in the absence of any loss of sensibility; so that the former has no necessary dependence on the latter. In general, however, the sensibility of the feet and hands is more or less impaired at the first appearance of the muscular disorder. The anæsthesia exists in various degrees in the skin, muscles, bones, and joints. Sometimes the tactile sensibility and that to pain are impaired together; but more frequently the latter remains unaffected. The sensibility to heat and cold is the last to be diminished, and it sometimes remains when both the tactile and the general are quite lost. When a sensation is artificially induced, it is slow in reaching the sensorium. Thus, smart pinching, or the pain of faradization, is not felt in less than two or three seconds, and may even be delayed nine or ten. The anæsthesia extends gradually from the soles and palms to the thighs and arms, and sometimes to parts of the trunk, but in less degree.

3. *Pains.*—These are of a peculiar character. They are described by M. Duchenne as occurring in all parts of the body, now in one spot, and now in another, but, at each access, continuing to occupy the same spot while the attack continues. The patient describes the pain generally as boring, but sometimes as shooting or lancinating. It usually occupies but a limited and circumscribed spot, which, during its continuance, is extremely sensitive, so that the slightest friction greatly aggravates it, though strong pressure may, on the contrary, give relief. It comes on in paroxysms, lasting from a few minutes to twelve, twenty-four, or forty-eight hours, or even longer, and consisting of short successive attacks, sometimes as quick as an electric shock, or the blows of a hammer, sometimes continuing for one, two, or three seconds, and returning at intervals of some seconds or minutes. These paroxysms are ex-

cessively and almost intolerably painful, often extorting cries from the patient. In addition to these interrupted pains, there are others which are constant during the paroxysm, spread over a larger surface, and occur preferably in the trunk, temples, or back of the neck. Sometimes the limb affected feels as if compressed in a vice; and, when the trunk is attacked, the patient will speak of it as if enclosed in a tight cuirass. He generally expresses himself in relation to the pains in the most exaggerated manner; and all speak of them in almost the same terms. Like rheumatic pains, they are usually provoked by changes of weather, and thus serve as a barometer, indicating the approach of storms. They almost always occur near the beginning of the disease, either alone or attended with other initial phenomena. Feeble at first, they progressively increase in severity, and at length become a source of torture to the patient. The foregoing description is essentially that of M. Duchenne, drawn from an experience of twenty cases; but others have met with instances in which the pains did not accord with it exactly.

4. *Disease of the organ of vision.*—Paralysis of one of the motor nerves of the eye is in general among the earliest symptoms. It only failed to occur in three of the twenty cases of M. Duchenne. The sixth pair of nerves is the one most frequently affected, generally on one side, but occasionally on both. Hence the strabismus and double vision which characterize the affection. The third pair is in a relatively few instances the seat of the paralysis; and the eyelid falls in various degrees. This affection of the muscles of the eye is often ameliorated, and may even disappear, without, however, any change, on that account, in the progress of the disease. It is an important diagnostic symptom.

Palsy of the retina, in greater or less degree, always complicates that of the motor nerves. At first there may be only a slight feebleness of vision, but the affection is almost never entirely wanting. It may even be noticed after the strabismus has disappeared, and sometimes occurs when that symptom has been wanting from the first. It may be considered, in connection with the strabismus, as a diagnostic character; for ordinary strabismus is not attended with amaurosis. The affection is most frequently confined to one eye, and on the same side with the strabismus when that exists; but too often it attacks both eyes, and the patient may be entirely deprived of sight. This is peculiarly unfortunate; as he thus loses an important aid in locomotion, while the complaint is yet local. It usually resists all means of cure.

5. *Other forms of paralysis and functional disorder.*—Hitherto our attention has been confined to the habitual and characteristic phenomena. Others are occasionally presented which are merely incidental. Thus, palsy of the fifth pair has occurred in connection with that of the third, extending in one instance to the palate and larynx, and in another to the seventh pair or portio dura. The smell remains always unaffected; and in one case only, under the observation of M. Duchenne, has the hearing been impaired. The genital functions are in man always more or less modified, and generally enfeebled or abolished. The occurrence of constipation and retention of urine, or of incontinence, with their causes, has been already noticed. The urine has not been found to contain any abnormal ingredient. Vomiting never occurs at the beginning; but sometimes, along with other digestive disorder, it comes on in the course of the complaint. There is never, in simple cases, either hesitancy of speech, or trembling of the lips or tongue, or signs of mental disorder. On the contrary, the integrity of the mental functions is a striking condition, even to the last. The electro-muscular contractility is always unimpaired. Finally, the patient is throughout the disease generally exempt from fever.

March. Duration. Prognosis. Diagnosis.

The disease, though local at first, is essentially invasive, and always tends to become general. M. Duchenne divides it into three periods; 1. that in which there is paralysis of one or more of the motor nerves of the eye, with more or less loss of vision, and the occurrence of wandering pains; 2. that of the first appearance of the diminution in the co-ordinating power; and 3. that of the generalization of the disease. But these stages do not always occur in regular succession, and sometimes, though very rarely, the first is wanting. The march of the disease is almost always slow, and irregular. The duration is usually very long, often for years, and sometimes many years. A case is recorded in which it has continued twenty years, and eight, ten, or twelve are not uncommon. The prognosis has been generally unfavourable, and until recently no case of cure was known. Recent experience leads to the hope, that this disease may come under the control of remedies; but the experience is yet too limited to admit of entire confidence.

Until recently locomotor-ataxy was confounded with various paralytic affections, from which there can now be no great difficulty in distinguishing it. Perhaps the affection which has been somewhat vaguely described as *tabes dorsalis* approaches most nearly to it in character; and there is reason to believe that many of the cases which have received that name were examples of this complaint. General spinal palsy, the paralysis of the insane, palsy of muscular sensibility, and progressive muscular atrophy, are other affections with which this has probably been confounded; but, if attention is paid to the special characters of locomotor-ataxy, there can be little difficulty in recognizing it. The strabismus with more or less amaurosis, the peculiar pains, the retention of muscular power with the loss of that of locomotion, the healthy fulness and firmness of the muscles as contrasted with their atrophy in true paralytic affections, and their unimpaired electrical contractility, are diagnostic symptoms sufficient to prevent any confusion if duly investigated. Sometimes, however, there may be a complication of this with other nervous affections, which may render a satisfactory diagnosis difficult.

Anatomical Characters.

When M. Duchenne first communicated his views of the disease to the public, only one case had been submitted to post-mortem examination, and nothing was found which could at all explain the phenomena of the disease. In this, however, no microscopic examination was made. Subsequently more careful investigations with the aid of the microscope, into the condition of the brain and spinal marrow, have revealed lesions which adequately explain the symptoms, and afford grounds for a plausible theory as to the nature of the disease. The first case thus examined was under the care of M. H. Bourdon, of Paris; and the result of the examination is contained in the *Archives Générales* for November, 1861 (p. 513). The observations made in this case have been essentially confirmed by others, which have been made in France, Germany, and England. The brain and cerebellum were perfectly normal. A portion of the tubercula quadrigemina was congested; and the gray substance of the isthmus, examined by slicing it from above downward, corresponding with the prolongation of the posterior fasciculi of the spinal marrow was found to be abnormally vascular. The spinal dura mater was also strongly vascular throughout its whole extent. It was, moreover, somewhat thickened and edematous above, though it presented no signs of recent or old exudation. The spinal pia mater was equally vascular; more so below than above, and on the posterior than the anterior surface; and where most congested it adhered firmly to the posterior columns of the cord. But the characteristic lesion was in the posterior columns themselves. Instead of their normal white opacity, they were transparent, glassy, of an amber-yellow colour in some spots, and reddish-yellow in others. Their consistence was less than normal, but they were not diffluent, and their continuity was not broken. This degeneration was greatest in the lumbar region, but extended to the dorsal, and, though attenuating, was still visible in the cervical, even up to the medulla oblongata. This appearance was owing to a transformation of the nervous tubes, most of which had disappeared, leaving nothing but the envelope. The external and anterior columns were not materially diseased; but the gray substance in the lumbar region, for the lower quarter of the cord, had lost its consistence, and its structure was much deranged, presenting at parts only broken fibres, fatty granules, and a formless detritus. All the ganglia of the lumbar region were enlarged and abnormally vascular; and, though their consistence was not diminished, their investing membrane was thickened, and, on being divided, gave unequivocal evidence of great congestion in enormously dilated capillaries, and effusion of bloody matters. Their corpuscles were variously altered in form, and covered with reddish-yellow granules. The nerves of the cauda equina were greatly changed in form, consistence, and colour; and the nerve-roots between the ganglia and the posterior columns were similarly changed, and had undergone the same degeneration. These changes were confined to the lumbar region, the dorsal being healthy. The motor nerves of the eye were modified in appearance; some of them being in the state of gray cords of not more than one-half their normal size, and very fragile. On following the exterior motor-nerves into the gray substance of the fourth ventricle, even to its point of origin, it was found to contain large vascular tubes between the original fibrils, which must have been much compressed. In a case examined by Dr. Oulmont, of the Hospital Lariboisière, the above observations were essentially confirmed. The lesion was mainly localized in the posterior fasciculi of the spinal marrow; in which a complete degeneration had taken place in parts, attended with the production of a prodigious number of amyloid corpuscles, in the transformation of the nervous substance. (*Arch. Gén.*, Avril, 1863, p. 484.)

Causes and Nature.

Causes.—Of these we may be said at present to know absolutely nothing. Many cases have occurred in which no preceding state of system, or peculiarity of exposure, was discoverable, which could have acted as a predisposing cause; and nothing could be ascertained as the immediate source of the disease: and where, in other cases, conditions have existed which might be suspected to have had some influence, they have been so various, that the relation between them and the disease could be considered only as incidental. In general the complaint has occurred in adult age, but rarely in the old; and men have been affected in much larger proportion than women.

Nature.—It appears to me that the microscopic observations in relation to the condition of the spinal marrow and lower part of the brain, not only enable a rational explanation of the symptoms to be given, but open also a view into the nature of the disease, which will take away from it anything mysterious, and place it within the scope of established pathological principles. The highly vascular state of the gray substance at the base of the brain communicating with the posterior columns of the spinal marrow, and of the membranes of the cord, as well as the thickening and adhesion of the latter, and the same condition of the motor nerves of the eye up even to their origin in the gray matter, prove incontestably the existence at one period of inflammation occupying these parts, and, extending probably down into the continuous posterior columns of the cord. This inflammation may have originated from any one of the numerous causes of that affection. Its existence would explain the early disorder in the visual organs, the violent pains in various parts of the body proceeding from inflammation or irritation at the root of the sensory nerves of the spine, and the sensations of tingling and numbness followed by loss of power in parts supplied with nerves from the affected portion of the cord. The disease thus established is maintained by the constant exercise of the function of the parts affected. There is every reason to believe that the power of associating muscular movement, wherever its centre may be placed, is exercised through the posterior columns. All motions, therefore, performed by the patient keep up the excitement in the inflamed tissue, and prevent the chance of subsidence by rest. The inflammation, therefore, becomes chronic; under its continued influence the vital powers of the parts diseased fail; and the tissue is in some measure surrendered to chemical influences, which produce degradation if not destruction of the tissue. The power of associating muscular action can no longer be exercised, since the very organ through which the function is performed has been more or less destroyed; while the several muscles retain their normal condition because supplied with influence through the uninjured anterior columns.*

Treatment.

M. Duchenne, though unable to point to a cure, was unwilling to place the disease in the category of the incurable. Encouraging ameliorations had taken place, sufficient to justify the hope that means might yet be found capable of effecting permanent relief. For some time, this hope did not seem to be justified by the results of treatment. Various remedies were tried, most of which were simply useless, some were positively injurious, and only a very few seemed to have done some good. Electricity was thoroughly applied, but with no apparent advantage. Strychnia produced only harm. Iodide of potassium was much used, and, though with apparent benefit in a few cases (*Med. T. and Gaz.*, Jan. 1856, p. 64), yet on the whole the reports have been rather against it than in its favour. Tonics may have been of service in some instances to the general health; but they exercised no favourable influence on the disease. Mineral waters were on the whole equally inefficient. Sulphur baths and sea-bathing seem to have done some good. Local measures to the spine all failed. At length accounts came from Germany that cures had been effected by Prof. Wunderlich, by means of nitrate of silver. Five cases of a disease called by him *progressive spinal paralysis*, but believed from the account of the symptoms to be the disease now under consideration, were reported by him in the *Archiv der Heilkunde* (A. D. 1861), of which one was completely cured by means of this remedy, and the others so much improved as to justify hopes of ultimate cure. In the *Archives Générales* for August, 1862 (p. 230), MM. Charcot and Vulpian gave an account of five cases in the Hospital Salpêtrière, very old and of the most unpromising character, which were placed on the use of the nitrate of silver, of which about one-seventh of a grain in the form of pill was given, at first twice a day, after a short time thrice daily, and in one case four times. All the patients were notably improved. A favourable change generally began in a period varying from four to ten days. The tactile sensibility and that to pain and temperature were clearly improved, the sight was improved, the movements acquired more precision, and the pains ceased entirely. One patient, who for years had been confined to bed, unable to rise, or even to turn himself, could now stand, and with assistance take some steps forward. With these evidences of amelioration, the general health also improved, constipation ceased, the appetite was increased, and the patient gained flesh. These are very encouraging accounts, and we may hope for still more favourable results in the future.

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* The organ through which associated muscular action is performed is probably brought into play whenever any movement is made in every part of the body; so that it is always in exercise unless during sleep, or in the lying position. In the day, therefore, it almost never rests; and consequently inflammation of the organ concerned has little chance of subsidence. This is not the case with the several muscles or their nerve centres; for each of these is much of the time at rest; even during active exercise, which calls the muscles alternately into action, one muscle or one set of muscles relaxing while the others are contracting. Hence the greater probability of this affection becoming chronic than other nervous diseases.

But the treatment I should myself be disposed to employ, were a case to come under my charge, would be based on the pathological views of the disease I have ventured to offer. I should treat it as an inflammatory affection, accommodating the remedies to the state of the system and the stage of the disease. Of course depletory measures could be used only in the early stage; and then moderately; as there seems to be little arterial excitement in any stage. It is not necessary to repeat an account of treatment so often already given in this work; but one measure that I should be disposed to insist upon would be rest in bed, so as to give the inflamed part chance to recover through repose. I have little doubt that, if the antiphlogistic plan were employed at an early period, before degradation of tissue had taken place, and perfect rest rigidly enforced as a part of it, the progress of the disease might be arrested. Of course the nitrate of silver would be employed on the ground of experience.*

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* *Scriveners' Palsy.—Writers' Palsy.*—Attention has recently been especially called to this affection by Dr. Samuel Solly, of London, whose remarks on the subject are contained in the *Lancet*, Dec. 1864 (p. 709), and in subsequent numbers. Though not unknown as a form of palsy, its true nature had not been understood. It is not, in fact, a form of paralysis, as this disease is generally defined, but an example of locomotor-ataxy, differing from the affection of Duchenne only in being strictly local. There are, no doubt, various other local examples of the same disease, affecting series of muscles appropriated to special functions; and we might thus multiply names indefinitely with the trades or occupations which call these several series into unusual action.

This form of locomotor-ataxy attacks persons much in the habit of writing, and is confined to the hand thus employed. It usually begins with a sense of stiffness of the hand, an uneasiness or local fatigue after using it, and often with feelings of formication or slight numbness, and pains in the thumb and fore-finger, sometimes shooting up the arm. These subside upon rest at night, but return with the use of the hand in the morning. A difficulty in performing the requisite motions with the hand now comes on, and gradually increases until the patient finds it impossible to write. The muscles, however, have not lost their power, for the hand can be used satisfactorily for other purposes. It is the power of properly associating them that is lost. There can be little doubt that the disease is seated especially in the nervous centres in the spinal column, through which the muscles employed in writing are co-ordinated for the purpose; and Mr. Solly expressly states that the patients sometimes complain of uneasiness over the spine in the lower cervical and upper dorsal regions. As in the generalized affection described in the text, the disease becomes at length extremely obstinate, in consequence probably of degeneration of the spinal tissue, following the over-excitement of the part in which it originated. If treated early, before this organic change has occurred, it may generally, perhaps always, be relieved; but in the advanced stage it seems disposed to resist all the measures employed in its treatment. It has not been known to endanger life, though the general health has often been more or less impaired.

The proper remedy is perfect rest to the function in the early stage of the disease. I have no doubt that a little blood taken by cups or leeches from the upper part of the spine, followed by a blister, would accelerate the cure; and other gentle antiphlogistic measures might be employed adapted to the state of the system. In its more advanced stages, various remedies have been used, among which strychnia and galvanism are the most prominent; but it is obvious that measures of this kind should be employed with great caution, for fear of goading the spinal centres, already over-excited, into increased disease. Continued rest to the function, derivation by remedies addressed to the upper part of the spine, possibly a very cautious use of mercury, and the use of iodide of potassium, with measures calculated to correct the general state of health, would be

SUBSECTION IV.

DISEASES BELONGING TO THE NERVOUS SYSTEM GENERALLY.

Article I.

PALSY, OR PARALYSIS.

PARALYSIS (from the Greek παράλυσις) is a loss, partial or complete, of sensation and the power of motion. This, however, though the usual definition, is not exact. Coma would fall under it, yet is not looked on as paralysis. Palsy is sometimes known to accompany coma; as when the absence of sensation and motion is observably more complete in one part of the body than in the remainder. Not unfrequently, a paralytic condition continues after the subsidence of coma; and must have previously existed along with it, though concealed by the general want of sensation. But if, in a comatose affection, an attack of apoplexy for example, no inequality is observable in different parts in relation to the two properties alluded to, and if, after the disappearance of the stupor, no deficiency of sensation and motion remains, the case is not ranked with palsy. In syncope there is an equal absence of the two properties; yet no one would class that affection with the one under consideration. Again, loss of the power of motion in a part may arise from mechanical impediment, from inflammation, or disorganization of the part, or from excessive pain; and in neither of these cases would the affection be looked on as paralytic. The definition, therefore, above given, must be received with considerable restriction. To entitle an affection to be regarded as paralysis, it must be independent of other obvious disease in the part, and must either be unattended with coma, or be shown to exist by inequality of sense and motion in different parts of the body during the continuance of the coma, or must appear upon the return of consciousness.

It is obvious that universal palsy must be instant death; so that no such affection can be recognized by the physician. But all or nearly all the voluntary muscles and organs of external relation may be paralyzed, and yet life continue for a time. Such an affection would be denominated *general palsy;* and the term is extended to all cases, in which the upper and lower extremities on both sides, and more or less of the trunk are involved. Very frequently only one-half of the body laterally is affected, the other side remaining sound. The disease is then called *hemiplegia.* Sometimes the palsy is confined to the lower half of the body, or to the two lower extremities, and in this case is named *paraplegia.* When one part of the body, as a limb, the face, the eye, the tongue, &c., is exclusively attacked, the affection is distinguished by the title of *local palsy.* Some writers have a distinct name for cases in which an arm on one side, and a leg on the other, are jointly affected; but such instances are rare, and may without violence be ranked with local palsy when they occur.

In some cases, the loss of sensation and the power of motion in the paralyzed part is entire, in others not so. In the former, the palsy is said to be *complete,* in the latter *partial.*

In the greater number of instances, sensibility and motion are simultaneously lost or impaired; but not unfrequently one property is affected without the other; or the two are affected in different degrees. When motion is lost

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the suitable treatment for the advanced stage. Nitrate of silver might be employed; and, should there be reason to suppose that the disease had become purely functional, and was sustained by want of energy in the nervous centres, galvanism and strychnia might be appropriate remedies.

without the loss of sensibility, the affection is someti
stances of this variety of palsy have been noticed in
been exalted, at least the susceptibility to painful i
there is a loss of sensibility, with retention of the po
Such cases are designated by the term *anæsthesia.*
frequently in the organs of sense; as in the eye, fo
nerve of vision may be paralyzed, and yet the ball r
in the tongue, in which taste may be lost, without
These, it may be said, are cases in which the part r
organ of sense, and has no inherent power of mo
there are cases in which paralysis of sensation is at
voluntary motion, even though nervous influence is
same nervous cords. Thus, the hand may be depriv
gers may move under the will; but, in such instance
attention should be strongly directed to the act, and
must see the limb that he attempts to move.

Pathological Conditions.—In most cases, palsy
morbid state existing in some other part than the on
may depend upon disease, either in the nervous cen
for the reception of impressions or the origination o
ducting filaments which form the communication bet
and these centres. But it may also be strictly local,
state of the terminal nerves. The nervous centres
matter of the brain, the spinal marrow, and the gan
ments probably make up the white matter of the brain
It follows that the true seat of the disease may be i
nal marrow, the conducting nerves, or the nervous r
lyzed part.

The particular conditions of the brain which occ
most part, been already fully considered under othe
cient here to mention simple sanguineous congestion
effusion, softening and induration from inflammation
generation, fibrinous exudation, suppuration, hydatid
various kinds, coagula in the cerebral arteries, and
injury from external violence. For an account of t
referred to *meningitis, cerebritis, apoplexy, organ*
cerebral congestion, &c. It is a fact worthy of notic
tent of the paralysis is by no means proportionate
lesion, as disclosed by post-mortem examination; a
in the brain sometimes producing greater effect tha
tion. The cause of this may be partly in the mor
more limited injury; but it is probably also in part,
precise correspondence of the lesion with the centres
rent seat of the palsy, or with the filaments connecti
probable, also, that the cerebral centres are sometim
and that, consequently, palsy may result without any
search for such lesion has sometimes been made in vai
which is not unfrequently observable in cases of artific
tainly of the functional character; as is generally al

Much attention has recently been paid to what is
that is, a palsy dependent on some influence from
nervous centres, disabling them from the performanc
consequently causing a paralytic condition in parts
sation and power of motion on these centres. Th
sionally occurs, I have no doubt. Many instances

nated rheumatic and hysterical palsy may originate in this source. What is the condition of the nervous centres in these cases is conjectural. They may be in a state of active congestion so strong as to suspend their function for a time; or it is possible that the exterior influence may act simply by a shock upon their susceptibilities, and thus temporarily deprive them of power; or lastly, they may be insufficiently supplied with blood, in consequence of the contraction of their capillaries, arising from irritation of the sympathetic centres; and it is probable that what is called reflex palsy actually originates, in different cases, in these three distinct modes.

It is clear that, as the brain is the organ of sensation, and of all action of the will, cases of palsy, involving these two functions, may arise exclusively in that organ, and can depend upon derangement of any other part only as that derangement interrupts the communication between the brain and the extreme nerves, or affects directly the extreme nerves themselves.

The pathological conditions of the spinal marrow producing palsy are precisely the same as those of the brain, and do not require repetition. (See *Diseases of the Spinal Marrow.*) The spinal centres may possibly originate palsy of the reflex or automatic movements, or those concerned merely in the organic functions, as the peristaltic movement of the bowels; but so far as concerns sensation and voluntary motion, disease of the spinal marrow can act only by interrupting the communication with the brain. It follows that, in cases of palsy from spinal disease, so far as these two functions are concerned, those parts only of the body will be affected which are supplied with nerves issuing from the cord below the seat of the lesion. It is also a necessary result that, when the cord is completely disorganized at any one part, throughout its whole thickness, an entire loss of sensation and voluntary motion must be experienced in the regions supplied by nerves from beneath that part, because the brain has no other medium of communication with those regions. Cases, however, are said to have occurred, in which the cord has been found completely diffluent, or quite divided, and yet the will has been obeyed by the muscles of the lower extremities. The probability is, in relation to these cases, that the complete diffluence has been cadaveric, and that when division of the spinal marrow has been observed, it may have resulted from post-mortem violence in the opening of the spinal cavity.

In relation to the influence of the ganglia in producing paralysis, too little is known to justify any extended observations. It is at least highly probable that their disorganization, from various causes, occasionally gives rise to loss of power in the organic functions which they influence or preside over; but they probably have nothing to do, as nervous centres, directly with palsy of sensation or voluntary motion. That they may operate sympathetically on the spinal cord so as to induce palsy indirectly is not impossible. Mr. Spencer Wells describes a species of partial paraplegia, or rather extreme debility of the lower limbs, connected with disease of the kidneys and urinary organs generally, and without any lesion of the spinal cord, discoverable during life or after death. He is disposed to attribute the paralytic condition to functional disorder of the spinal centres, sympathetically produced through the ganglia connected with the urinary organs. (*Med. Times and Gaz.*, Nov. 1857, p. 493.)

The conditions in the course of the nerves, which occasionally constitute the true pathological state of palsy, are compression from without the body, or by tumours, congestion, extravasation, &c., in or near them, mechanical division or other destructive violence, inflammatory softening or disorganization, and perhaps fatty degeneration. The main nerves proceeding from paralyzed parts have been found, after death, enlarged or atrophied, softened or indurated, and sometimes quite disorganized; the nervous matter within the membrane being completely diffluent.

The sentient nerves may be rendered [illegible] for re
which [illegible] from the brain and thus become the [illegible]
may want of use, by an interruption of a sufficien
that the nervous [illegible] by long or severe press
congestion or inflammation of their own tissue
[illegible] in gout and rheumatism. There are also cer
to have the property of directly depressing nervous
any [illegible] of the nervous centres or
the [illegible] poisons, especially lead and arsenic. Co
[illegible] Every one is familiar with the loss of sensati
the body consequent on their direct exposure to sev
That palsy should sometimes be partial is easily
nerves may suffer in a degree insufficient wholly to
[illegible] powers, or the conducting fibrils may
as well to convey the nervous current through imper
The injury in different degrees of the properties
of the [illegible] of one while the other remains una
paralysis, since the beautiful discovery that the tran
the nervous centres, and of motor influence from th
distinct nervous cords, and probably by distinct fibr
tions of the brain and spinal marrow. It may readi
producing the palsy may affect one of these cords
chiefly or exclusively, so as to impede the transmis
ence only, or of the two unequally. Thus it is well
rior roots of the spinal nerves convey impressions t
anterior, motor influence from the brain; and there
that these different transmitting powers continue, in
vous matter of the spinal cord and the white matte
tres in the latter organ. Should the lesion, therefore,
or of the spinal marrow, or of the cerebral fibres, be
only, we shall have loss of sensation without loss of
only, loss of motion without that of sensation.

A third fact, explicable upon the principles here
palsy may originate in the brain or spinal marrow, it
limited; to a small portion of one limb, for exampl
cle, notwithstanding that the conducting nerve ma
parts unaffected, as well as with the one diseased. E
culiar centre in the brain, and its peculiar nervous
nection with that centre, though a number of thes
within one general sheath. Should one only of th
only of the special connecting fibrils be affected b
necessarily follows that the palsy must be confined to
the peripheral extremity of this connection.

Still another interesting fact in the pathology of
tion, is the occurrence of the paralysis on the side o
bral lesion, in which it may originate. In relation to
of the brain, this fact is almost universal. A few i
which the cerebral and paralytic affections were on t
bability is that, in these, though the lesion may hav
the palsy, the shock produced by it was felt most str
of the brain. This tendency to the occurrence of t
site to the lesion is usually ascribed to the decussati
the medulla oblongata; the anterior pyramids mutu
pass out of the cranium. An apparent anomaly e
which obeys the general law, notwithstanding tha

and the portio dura of the seventh, arise from roots above the point of decussation. But there can, I think, be little doubt, that these nerves will be traced ultimately to a lower origin, if, indeed, they may not be considered as having been already thus traced by Sir Charles Bell and Mr. Solly. There is some difficulty, however, in relation to the cerebellum. The fibres of this portion of the encephalon do not decussate; yet the palsy which follows lesións of its tissue, obeys the general law in occurring upon the side opposite to the lesion. This apparent anomaly is explained by the connection between the fibres of the anterior pyramids and the pons varolii, which consists chiefly of filaments from the cerebellum. The shock producing the paralytic phenomena very probably passes in this direction; and the paralysis does not depend immediately upon injury of the cerebellum, but upon that of the cerebral fibres in close connection with it. Physiologists are disposed to believe that the cerebellum has nothing to do directly with the power of voluntary motion; but is only the instrument through which the motions are associated. Sometimes the palsy of the face is on the opposite side to that of the rest of the body. Dr. Gubler, who names this affection *alternating hemiplegia*, ascribes it to injury of the pons varolii. (*L'Union Médicale*, Sept. 29, 1857.) The palsy which results from any lesion of the spinal cord is upon the same side as the lesion.*

General Symptoms.—Palsy may come on suddenly or gradually. In the latter case, the paralytic phenomena are usually preceded by deranged sensations, such as pricking, formication, coldness, weakness, &c.; feelings, which are ordinarily indicated when a part, as the foot or hand, is said to be asleep. A large portion of the body may be attacked at once; or the affection may begin in one small spot, and gradually extend more or less over the system. In the latter case it is called *creeping palsy*. Not unfrequently the paralysis, in its incomplete state, is attended with tonic or clonic spasms, which sometimes amount, in the one case to convulsions, in the other to tetanic rigidity. In some instances, there is permanent flexion of the limbs, with stiffness of the joints. Pains in the palsied part are not uncommon. They may be slight and dull, or sharp and lancinating. The limb generally wastes, the muscles become flaccid and diminished in bulk, the skin is pale, the circulation is usually more languid than in health, and the temperature is somewhat lowered. There is a diminution of the power of regulating temperature, so that the part becomes colder or warmer more easily, according to the degree of heat of the surrounding medium. The atrophy is ascribable partly to want of use, partly to the diminution of the nervous influence necessary for the perfection of the organic actions; and, as this influence is supplied more especially by the spinal marrow, paraplegia, which usually depends on lesions of that structure, is more apt to be attended with atrophy, than hemiplegia, which generally originates in the brain. From obvious causes, the palsied limb sometimes becomes edematous. The system is variously affected, according to the character of the lesion upon which the palsy depends; but the general tendency of the complaint is to produce a feeble state of health, consequent, probably, in part at least, upon deficient exercise. The mind is also very often weakened, but rather as the result of the cerebral disease which produces the palsy than of this affection. The memory is very apt to fail, especially for recent incidents and for words. Sometimes there is a striking change of temper; good-natured persons becoming peevish, fretful, and very troublesome, while those before haughty or irascible, become gentle, meek, and amiable. There is a general tendency to the feeble emotions; and paralytics are apt to shed tears upon slight occasions. It is said that palsy is now and then regularly periodical in its attacks, with perfect intermissions.

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* Dr. Marshall Hall, believing that muscular irritability depends on the spinal centres, while voluntary motion and sensation are cerebral functions, and also that by impairing or abolishing these functions muscular irritability is increased, inferred that we might distinguish paralysis exclusively spinal from that exclusively cerebral, by the quiescence of the muscles under galvanic influence in the former, while their contractility under the same influence is increased in the latter. But Dr. Brown-Séquard has shown by experiment that entire reliance cannot be placed upon this test (*Med. Examiner*, N. S., ix. 25); and Dr. R. B. Todd, of London, infers from his experiments that the excitability of a paralyzed limb, under galvanic influence, is proportionate to the degree of force in the nerves of the limb, without having any special reference to the brain or spinal marrow; and the practical conclusion to be drawn from an increased sensitiveness to this influence is, that the lesion in which the paralysis originates is of an irritant or inflammatory character. (*Medico-chirurg. Trans.*, xxvi. 480.) According to M. Duchenne, however, the contractility or non-contractility of a muscle under electrical excitation is, to a considerable extent, a test of the nature and origin of the lesion. It is stated by this author, as the result of his observations, that when electro-contractility is lost or impaired, either the lesion is in the spinal marrow or connecting nervous trunks, or the paralysis is owing to the influence of lead, which appears to act directly on the extreme nerves; when the muscle responds to electro-excitation, the palsy is either of cerebral origin, or of the kind denominated rheumatic or hysterical, or dependent on atrophy or fatty degeneration of the paralyzed muscle itself, which retains its contractility so long as any portion of the fibre remains. (*Note to the fourth and fifth editions.*)

The character of the paralytic symptoms often affords a certain degree of evidence as to the special origin of the affection. Should the palsy be incomplete, and attended with clonic spasm or convulsions, we may infer the probable existence of cerebral or spinal meningitis. Should it come on gradually, and be attended with rigid muscular contraction, especially of the flexors, there may be reason to apprehend the existence of cerebral or spinal softening of an inflammatory character. Occurring gradually, without contraction, it may possibly arise from non-inflammatory softening, as from fatty degeneration, either in the centres, the conducting nerves, or in the nerves or fibres of the muscles affected. Sudden attacks, as quickly disappearing, without obvious dependence upon some other cause, may be referred to congestion. Similar attacks, preceded by signs of congestion in the brain or spinal marrow, and having a certain degree of persistence, and especially when attended with apoplectic symptoms, may be considered as probably the result of hemorrhage.

To complete an account of the symptoms of palsy, it will be necessary to notice its several varieties, both in reference to the position, and to the nature or origin of the affection.

General Palsy.—This may depend on disease of the brain, or of the cervical portion of the spinal marrow, or upon some cause affecting the whole nervous system without obvious lesion. It is in some instances quite sudden, as when dependent on injury of the brain or upper part of the spinal marrow, or upon apoplectic effusion. In other cases it may be slow, beginning in some one point, generally in the extremities, and advancing with greater or less rapidity until it involves most of the voluntary muscles, and perhaps at last putting an end to life by paralyzing respiration. It is exceedingly painful thus to see the disease rising irresistibly upward, like the tide around an individual unable to change his place, and drowning him at last by the mucus of his own lungs, which the palsied muscles have not strength enough to expectorate. It is wonderful, however, to what an extent general palsy sometimes proceeds without immediately destroying life. Voluntary motion has been almost completely lost, and several of the senses paralyzed, so as nearly to shut out communication with the exterior world; yet the organic actions have been maintained for a considerable time. In the end, however, deglutition becomes involved, the sphincters give way, and, if asphyxia or syncope do not result from the participation of the lungs and heart in the disease, the patient sinks under a general failure of the vital functions. Yet the disease is not necessarily fatal. Sudden cases, dependent on sanguineous congestion, sometimes get well; and the same event may occur after effusion of blood, though recovery is tedious and generally imperfect. The most discouraging cases are those which begin at a point, and gradually spread over the system. They usually indicate incurable lesions of the spinal marrow, advancing until most of the cord becomes involved. Yet even such cases have recovered.

The affection called by Cruveilhier *atrophic muscular palsy*, by Duchenne *progressive fatty muscular atrophy*, is usually considered as a variety of general palsy, though wholly differing in character from the ordinary forms of that disease. It is an affection of the muscles, which, without loss of sensibility, gradually lose their contractility, and undergo a species of atrophy, connected with fatty degeneration of their fibres. They shrink so much that a hollow can often be perceived, in the place where the muscle had previously occasioned a prominence by its bulk. It may at first affect only one or a few muscles, in which case the atrophy is striking, from its contrast with the fulness of the neighbouring muscles. It often gradually extends until a large portion of the voluntary muscles become affected, so that the patient loses all power of locomotion, though still retaining his sensibility and intelligence unimpaired. Even the organs of deglutition and voice may be invaded, and ultimately those of respiration, with the effect of causing death from apnœa. Cruveilhier has demonstrated that this atrophy and motor paralysis of the muscles is connected with a similar atrophy of the anterior roots of the spinal nerves, corresponding with the muscles affected. He thinks also that the muscular affection is dependent on the disease of the nerve; but it may be said that the nerve dwindles in consequence of the loss of its function through the paralysis of the muscle; and the success of M. Duchenne in restoring power and bulk to the muscle, by electrical stimulation applied to it, is in favour of the latter view. The probability, however, I think, is that a close microscopic examination of the spinal marrow would reveal the real source of the disease to be in that structure.

Hemiplegia.—Palsy of one side of the body is most frequently an attendant upon apoplexy, and, even when not accompanied by comatose symptoms, generally depends upon cerebral hemorrhage. It may, however, arise from lesions of the spinal marrow. Sometimes it begins in one of the extremities, and thence slowly advances until the whole side becomes affected; but, in the great majority of cases, the attack is sudden. The leg, the arm, the trunk, and the face may all be involved, even the intercostals of the affected side; and both sensation and motion are usually impaired or lost. The line between the diseased and sound side often precisely follows the median line; even the tongue and lips being half paralyzed. It frequently, however, happens that different parts are affected in different degrees; and, in such cases, the lower extremity, as a general rule, is less diseased than the upper. Patients often recover from hemiplegia, sometimes completely and permanently, but much more frequently only partially. The lower limb almost always recovers its powers before the upper, and not unfrequently the patient is able to walk, while the arm hangs useless by his side. Unless the symptoms disappear speedily, indicating a mere congestion as the cause, the amendment is usually very slow, and the patient, though he may sometimes be restored to activity and usefulness, more frequently remains with impaired powers of mind and body, and almost always carries to the end of life some remnant, less or greater, of the attack. The disease, moreover, is very liable to return.

Paraplegia.—This may affect only the lower extremities, or may involve also a part of the trunk, the paralysis being bounded above by a transverse line. It generally proceeds from lesions of the spinal marrow; but sometimes has a cerebral origin. In the former case, it is generally attended with some direct evidence of disease in the spine, such as pain, tenderness on pressure, or deformity; in the latter, with headache, vertigo, disordered vision, tinnitus aurium, &c. A case is on record in which it seems to have originated in obstruction of the aorta, without discoverable disease either of the brain or spinal marrow. (*Arch. Gén.*, 5e sér., xii. 160.) Occasionally its attack is sudden; but in most instances it comes on slowly, commencing with sensations in the lower limbs before alluded to as frequent precursors of palsy, such as tingling, &c., with slight muscular weakness, evinced by unusual fatigue after exertion, and some unsteadiness in the gait. As the affection increases, the patient walks with gradually increasing difficulty, seems to drag his feet along the ground, often stumbles, and requires the aid of another's arm to support him. At length he loses all command over the limbs, and is confined to his chair or bed. Not unfrequently he complains of the want of proper feelings when his bowels or bladder are evacuated; constipation and retention of urine take place, requiring enemata and the use of the catheter; and finally the sphincters give way, and incontinence is added to his other troubles. It has been observed that the urine is apt to be offensive, alkaline, ropy, and disposed to the deposition of inorganic matters; a condition probably owing to the defective innervation of the urinary organs. Sloughing of the back and hips usually takes place before death. It is an interesting fact, that, by tickling the sole of a paraplegic limb, or otherwise irritating it, involuntary contractions of the muscles may sometimes be produced; though they utterly refuse to obey the will. This is ascribed to the reflex action of the spinal centres; and may take place when all communication is cut off with the brain, by complete destruction of the spinal cord at some point above the origin of the nerves of the limb.

When the result of acute myelitis, paraplegia may have a rapid course; but it is usually chronic, and not unfrequently continues for years. Sometimes it appears to be purely functional, depending upon debility of the spinal centres, whether from over-excitement through venereal excesses, severe muscular exertion, the abuse of ardent spirits, &c., or from some direct sedative agency, as that of cold.

Dr. Brown-Séquard teaches that there is a frequent form of paraplegia, depending on the action of various external irritations upon the spinal cord, thereby inducing a reflex influence from the latter upon the extremities. This he calls *reflex paraplegia*. Though by no means original in this conception, he has given it much greater extension than other writers, and in his treatise on paralysis of the lower extremities, enters largely into the consideration of its causes, nature, and treatment. It has not happened to me to meet with many cases of this kind; but of their occasional existence there can be no doubt; and, as cases of reflex palsy arising from irritations from without upon the cerebral centres are admitted to occur, there is no reason why similar results should not happen from similar influences on the spinal substance. The seat of the external irritation may be in the skin, the mucous or serous membranes, or the abdominal viscera, and especially in the urinary and genital apparatus. Dr. Brown-Séquard explains the paralytic result by supposing that a contraction of the vessels of the cord is produced by these external irritations, and that thus the spinal centres are prevented from duly performing their office. To me it seems probable that the paralysis results either from a temporary congestion in the cord repressing function, or from a direct reduction of nervous power, as we often notice when a powerful irritation is made to act on a nervous centre. This form of paraplegia may be distinguished from that originating in myelitis, or other organic affection of the cord, by the precedence of the external symptoms, by the absence of signs of spinal disease, by the incomplete character of the paralysis and its indisposition to extend beyond the lower extremities, and by the frequent facility and rapidity of the cure.

In its early stages, paraplegia is often cured; but, when it is far advanced, with complete palsy of the limbs, involving the rectum and bladder, the prognosis is unfavourable. It is important to attend to the first signs of tingling, numbness, and weakness of the limbs, and to address the remedies efficiently to the seat of the lesion.

Local Palsy.—Local palsy is exceedingly diversified in position, degree, and character. It may affect one limb, a portion of a limb, a single muscle, or a number of muscles associated in a particular function, as, for instance, deglutition and voice; it may be complete or partial; and, finally, it may affect motion exclusively, or sensation exclusively, and the sensation affected may be general or special. It is unnecessary, nor would our space permit us, to follow it in all its diversities. There are, however, some points of interest on which it is proper to touch.

The *face* is sometimes the exclusive seat of palsy. Generally only one side is affected, and that variously. The disease may originate in a cerebral lesion, or in some injury to the nerves of the face in their course. The *portio dura* governs the general movements of the face; and paralysis of that nerve involves the loss of command over the features. In such a case, even when the countenance is at rest, there is a slight difference between the opposite sides; as a sound muscle is scarcely ever so thoroughly relaxed as one that is perfectly paralyzed; but this difference becomes very striking when the patient smiles, or in any other way moves his features. In doubtful cases, the paralysis may be at once detected by inducing the patient to smile or laugh. When caused by disease of the portio dura, it is usually more complete than when of cerebral origin. In the latter case, some power over the muscles in general remains. Thus, in the cerebral palsy the eyelids may be partially closed, in consequence of some remaining mobility in the orbicularis muscle; while, in that of the seventh pair of nerves, the power over that muscle is usually quite lost. (*Trousseau.*) The palsy from the latter cause is often preceded or attended with pain in the ear. (*James Jackson.*) When the disease is confined to the portio dura, sensation remains in the face, and mastication is not affected; as the masseter and temporal muscles derive their nervous influence from another source. Should the *fifth pair* be diseased, there is then palsy of sensation, with or without deficient power of mastication. One-half of the face is insensible to the touch, and the lip is equally divided between the morbid and healthy state. Hence, when the patient drinks, he receives the impression that the bowl which he puts to his lips is broken. The fifth pair of nerves appears to have two roots, like the spinal nerves, one being exclusively sensorial, and the other motor. It is the latter which supplies the muscles that close the jaws, which may therefore be paralyzed when the whole of this nerve is affected, or may escape, if the disease be confined to the sensorial portion. Occasionally the paralysis of sensation is confined to one small isolated portion of the cheek. This I have seen in a case of severe facial neuralgia. I have also seen palsy of sensation in one-half the lower lip, extending to the chin, following severe inflammation from a broken tooth, and depending probably on pressure upon the nerve as it passes out of the foramen in the lower jaw. It disappeared entirely in the course of two or three months.

The eyelids may be paralyzed so that they cannot close, or cannot open, under the influence of the will. Palsy of the muscles of the ball occasions strabismus. There may also be a loss of general sensation in the eye, so that the conjunctiva shall cease to feel the contact of irritating substances. Under these circumstances, severe and even disorganizing inflammation of the organ is apt to occur.

The muscles of *deglutition* are sometimes exclusively affected with palsy; as also are those concerned in the formation of *voice*. In some instances, the

disease is confined to the tongue, in which case the
voice, is unable to *articulate*. He can make a soun

There may be exclusive palsy of the *rectum* or
constipation and retention on the one hand, or to i
according as the sphincters may or may not be inv

The organs of special sensation are not unfreq
same general observations in relation to the real se
them, as to the parts already referred to; that is, t
originate in the nervous centres, the connecting n
or in the nervous expansion of the several organs.
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which the reader is referred. Loss or diminution
named *anosmia*. It may depend on disease at th
nerve, in its course, or in the pituitary membrane i
is said sometimes to induce it, by wearing out the
It may be produced also by chronic inflammation
some it appears to be congenital. Paralysis of tast
ally met with. The temporary loss of taste arising
tongue, or a coating of fur upon its surface, scarcel
true palsy of the function is connected with an alter
nerves of taste, or of the centres from which the
affection and in anosmia, the general sensation ma
substances shall occasion uneasiness, though odou
strongest kinds, may not be perceived. *Deafness* o
lytic affection, though not necessarily so. Thus, w
page of the eustachian tube or external meatus, o
panum, it has no relation to palsy. The true pa
cerebral, may be produced by injury of the nerve
into the temporal bone, or by disease affecting the
the cavities of the petrous portion. As in all othe
tion may be organic, or merely functional. As to p
or *anæsthesia*, most that could profitably be said, o
been embraced in the preceding observations. St
of touch are probably distinct from those of general
be palsy of one without a similar affection of the oth
of touch is quite lost in a part, so that the shape a
ties of a body cannot be appreciated, the sensibilit
remains; while, in the state of artificial somnamb
serve a complete loss of sensibility to painful impr
of touch may be acute. Yet the two generally go
know that any therapeutical advantage can accrue

It yet remains to speak of peculiar kinds of pals
characters, or their causes, from the ordinary affecti

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* The degree of anæsthesia may be measured, with so
method suggested by E. H. Weber. When the two blunted
are applied to the surface, within a certain distance apart,
healthy skin; beyond this distance both points are felt;
of sensibility is the distance between the points at which t
pression. Sometimes in this mode a commencing paraly
when it would be scarcely sensible otherwise. Ascertain
consistent with singleness of impression on a part of the
and, if the distance is considerably greater in another par
to be paralyzed in proportion to the distance. Dr. Sievel
ment, based on the same principle, and consisting of a rod
inches and tenths, upon which slide two movable points, s
which the two points are felt as one, and which is the mea
sis, may be seen accurately by a glance of the eye. (*Note t*

Paralysis of the Insane.—This has attracted much attention, and has been the subject of close research by MM. Bayle, Delaye, Calmeil, Parchape, and others. It comes on usually in the course of certain cases of insanity, but sometimes begins simultaneously with the mental disorder, and sometimes precedes it. It seldom occurs in the young, and does not become frequent until after the age of thirty-five. In general the first symptoms of paralysis are observed in the organs of speech. The patient hesitates in speaking, or stammers, pronounces words imperfectly, and has a tremulous motion of the lips and tongue. The expression of the countenance changes. Weakness in the lower extremities comes on, indicated by an unsteady gait, and a dragging movement of the feet in walking. The disease extends to the upper extremities. The bladder becomes enfeebled, the urine is passed with difficulty, and a resort to the catheter is often necessary. At length the power of locomotion ceases, and the patient is confined to his chair or bed. Along with the paralysis, there is frequently contraction of the muscles, especially of the lower extremities, one or both of which becomes stiffly flexed. Sometimes the patient is attacked with convulsions, or tetanic paroxysms, which may occur on both sides, or be confined to one. In the end, incontinence of urine and involuntary feculent discharges occur, gangrenous ulcers form, and the mind is reduced to the lowest stage of imbecility. In this condition, the organic actions go on often with considerable vigour, and the patient may live for months or years. Finally, however, deglutition becomes paralyzed, respiration enfeebled, the heart beats more and more feebly, and the patient dies either from a gradual failure of the organic processes, or from a supervening attack of cerebral congestion. Dissection almost invariably reveals softening of the gray matter of the brain, induration or softening of the white matter, and signs of chronic meningitis. The duration of the disease is indefinite, varying from a few weeks to many years. Calmeil states the average at thirteen months. The disease is generally fatal, almost invariably so when it becomes confirmed.

Shaking Palsy.—Paralysis Agitans.—This affection is characterized by a continued tremulousness, generally first observed in the upper extremities and the head, but extending in a greater or less degree over the whole body. It is most striking in the hand. In the beginning it is little noticed, unless upon the occasion of some unusual exertion or mental emotion; but in the end it becomes constant, and continues even during sleep, with which it sometimes interferes by its violence. The muscular debility gradually increases, until at last locomotion becomes impossible, and articulation and deglutition difficult; the patient loses command over the sphincter muscles; and, coma or mild delirium supervening, the case terminates in death. The disease affects especially the old, and those worn out by excessive intellectual or corporeal labour, intemperance in drinking, and other sensual indulgences. Some constitutions are strongly disposed to this form of palsy, and fall into it without any exciting cause.

Very similar to the complaint just noticed is the tremulousness sometimes experienced by certain artizans, which has been ascribed to mercury, because it is more especially the workers in that metal who are affected. Along with the tremors, there are occasionally spasmodic twitchings of the muscles, and the agitation sometimes amounts almost to convulsions. In its course and termination, the disease is similar to that last mentioned; but it is susceptible of cure, if not far advanced, by the removal of the cause.

Rheumatic Palsy.—This name is applied to a variety of the disease, coming on after exposure to cold. It may be quite local, affecting only one or a few muscles, or it may have the form of paraplegia. It is sometimes preceded by pain, but is probably quite as often without it. The sensibility is unimpaired. If the affection continue long, the muscles may become atrophied from want of use, and contract variously so as to produce distortion of the limbs. The most frequent seat of it is the forearm or shoulder. Sometimes it occurs in the muscles of the face supplied by the portio dura. The disease is probably seated in the nervous sheaths in the local cases, and in the membranes of the spinal cord when it is paraplegic.

Hysterical Palsy.—Palsy occurring in hysterical persons, and not traceable to any special lesion, is usually thus designated. Sensibility is generally lessened along with the loss of voluntary motion; but the contractility under electric excitation remains.

Lead Palsy.—Under the poisonous influence of the preparations of lead, a variety of palsy not unfrequently occurs, sometimes originally, but much oftener as a sequel to colica pictonum. The affection usually first attacks the hand and forearm. Weakness is felt in the hand and wrist, which increases until the patient becomes unable to use them. A peculiarity of this form of paralysis is that the extensor muscles are chiefly affected, in consequence of which the fingers are usually flexed on the hand, and the hand on the forearm. But the flexion is not rigid, and the parts can be easily placed in their proper position. Neuralgic pains are occasionally felt in the arm, and in other parts of the body. The muscles affected become flabby, wither, and undergo a change in colour, which has led to the erroneous supposition that they are converted into fatty matter. Should the action of the poison continue, the paralytic phenomena extend to other portions of the body, the special senses are invaded, and the patient dies at length from debility of the brain. There is reason to believe that the lead acts directly on the paralyzed tissue; for it has been observed that the muscles affected by it have lost their irritability, which is often retained in cases of palsy dependent on disease of the nervous centres, or the connecting cords. (See *Arch. Gén.*, *4e sér.*, xxii. 12.)

Other metals are accused of occasionally inducing palsy, and the effect is especially ascribed to arsenic.

Causes.—Upon this point sufficient has been said already, in connection with the several pathological conditions of which palsy is a symptom. In general terms, it may be repeated that whatever interferes with the structural integrity of the nervous centres, the conducting nervous filaments, or the ultimate nervous ramifications, and whatever greatly depresses, either by a direct agency or through a previous excessive excitement, the nervous functions, whether at the periphery or at the centre, may become a remote cause of paralytic symptoms. Among the special causes may be mentioned syphilis, which appears to lie at the foundation of various nervous diseases, as epilepsy, for example, and which seems capable of inducing different forms of palsy. The causes of the special forms of palsy have been referred to, in the preceding accounts of its several varieties.

Diagnosis.—There is in general little difficulty in recognizing palsy. Sometimes, however, it is so masked by stupor that the diagnosis is uncertain. But, even in cases of this kind, unless the coma is very profound, there is some degree of sensibility or power of motion left in the unparalyzed parts, which enables us, upon a close inspection and comparison, to detect the disease in the parts affected. There may be occasionally some difficulty in deciding whether a part, deprived of the power of motion, is labouring under palsy, or under chronic inflammatory disease of a rheumatic or gouty character. But, in such cases, the history of the disease will usually decide the question. I believe, however, that the two affections are not unfrequently mingled; that, in consequence of rheumatism in the course of a nerve, paralytic symptoms may be produced in the parts supplied by its ramifications; and that the same disease may partially paralyze the nerves of the part in which it has long existed. Such a condition has long been recognized under the name of *rheumatic palsy*.

Prognosis.—This varies so much according to the particular origin, and the remote etiology of the affection, that no definite rules can be given. In general terms, it may be said that cases dependent on mere congestion are curable, and often yield speedily to remedies. When connected with cerebral or spinal hemorrhage, the disease is more serious, but still not unfrequently ends favourably, though apt to be lingering, often imperfectly cured, and liable to relapse. The palsy consequent upon inflammatory disorganization is very unpromising, when far advanced generally incurable, yet frequently amenable to remedies in its incipient stages. Still more discouraging are the cases connected with fatty degeneration, tumours, hydatids, &c. within the cerebro-spinal cavity. If merely functional, dependent on habits of life, metallic poisoning, &c., there is good ground for the hope of a favourable issue upon the removal of the cause, provided the system has not been too deeply prostrated, and the nervous excitability quite exhausted. Cases originating in local and removable causes may be expected to recover, as when dependent on compression, want of use, external inflammation, tumours in the course of the nerve, &c. The slight cases resulting from temporary compression, such as palsy of the arm produced by lying upon the humeral nerves during sleep, generally get well without difficulty. Reflex palsy yields in general more easily to remedies than that dependent on lesions of the nervous centres.

Treatment.—The first point, in the treatment of palsy, is to ascertain the pathological condition on which the affection depends, and to address our remedies to that condition. Of the requisite measures it is unnecessary to treat in this place, as they have been fully detailed under other heads. The reader is referred to the subjects of *inflammation of the brain and its membranes, apoplexy, cerebral congestion,* and *diseases of the spinal marrow.* It may not be amiss to state, in general terms, that the remedies in cases of active congestion, active hemorrhage, or inflammation, are bleeding, general and local, proportioned to the energies of the system, purging, refrigerants, low diet, rest, and if these fail, blisters, and a mercurial impression. In chronic cases, much may be expected from a constant succession of blisters as near to the seat of the true disease as possible, with steady but moderate purgation, graduated to the strength of the patient. In hemiplegia, the blisters should be applied to the back of the neck, and between the shoulders; in paraplegia, when dependent on spinal disease, immediately over the affected part of the spine. Antimonial pustulation, issues, setons, or moxa may be substituted for blistering, if circumstances seem to require them. The same treatment must be directed to the local palsies having a similar origin; care being especially taken to make the depletory and revulsive measures bear as precisely as possible upon the real seat of mischief, whether in the brain, spinal marrow, or course of the nerves. Should the local lesion on which the palsy depends arise from depressing influences affecting the organization, as in cases of fatty degeneration connected with defective nutrition or impoverished blood, a tonic and supporting treatment becomes necessary; and, under these circumstances, recourse should be had to the preparations of iron, the vegetable tonics, and nutritious food.

It need scarcely be said that, when the palsy originates in tumours, or any other removable cause affecting one of the nervous trunks, attention should be promptly directed towards the correcting of the evil; and it is a primary rule, applicable to all varieties of the disease, to prevent the continued action of the cause whatever that may be.

When there is reason to believe that the original cause of the palsy has been remedied, and the affection remains only in consequence of debility, or a habit of inaction in the nervous centres, or the nerves themselves, an indication is offered for a new course of treatment. It now becomes advisable to make use of measures calculated to excite the nervous actions. It is a very common error to resort to these measures early in the disease, and while the organic cause is still in operation. Nothing could be worse than such a proceeding. Some evidences of muscular action, or restored sensibility, may occasionally result from stimulating the nervous centres, or the nervous extremities, under these circumstances; but the apparent advantage is temporary and delusive. The real source of the evil is increased. What good can possibly arise from stimulating a portion of brain, already goaded by inflammation, or weltering in effused blood? or from exciting a palsied limb, when cut off from the sources of its power? The indication is clearly, first, to correct all organic derangements, to put the vital instrument into the best possible order, and then to excite it if necessary into action. There are cases in which the palsy is dependent on a depressing agency, and the affection is functional from the commencement. To such cases, the treatment suitable to the advanced stages of the former variety may be applied in the beginning. Of this kind, for example, is the disease produced by lead.

The remedies of a stimulant character operate either through the system, or locally. The most efficient of the constitutional remedies is nux vomica, or its alkaline principles, strychnia and brucia. These act by a direct stimulant influence upon the nervous tissue, and especially promote the motor power. When properly timed, they are undoubtedly sometimes very beneficial; though capable of doing great mischief if prematurely or improperly used. All evidences of excitement and of inflammation should have subsided before they are resorted to. In hemorrhagic cases, time should have been allowed for the clot to become isolated from the cerebral tissue (see *Apoplexy*), and thus to cease acting as a source of irritation. Two or three months at least should, as a general rule, have elapsed before the remedy is resorted to, and often a much longer time than this. When employed, it should be with great caution; and, if the complaint is in any degree aggravated, it should be withdrawn at once. The best preparations, upon the whole, are probably the alcoholic extract and strychnia. Of the latter, not more than one-twelfth of a grain should be given at first, and this should not be repeated oftener than twice or three times a day. Should it produce no effects, the dose may be increased gradually until slight startings or involuntary contractions of the muscles take place, or some feeling of stiffness about the neck or elsewhere. One of the first observable effects of the remedy is to occasion a pricking sensation in the affected limb; and it has been noticed that the first involuntary contractions which it produces are usually in the paralyzed part. Sometimes strychnia may be beneficially applied endermically. One-quarter of a grain of it may be sprinkled upon a blistered surface in the epigastrium, or on the inside of the arm or thigh, or in the vicinity of the affected nervous centres; and the application may be repeated twice daily. It has also been used in the way of subcutaneous injection, with asserted success in some instances.

Other internal stimulants may also be occasionally used with advantage. *Oil of turpentine* and *cantharides* are especially applicable to cases of paraplegia or local palsy, dependent on spinal affection, or to the disease when limited to the urinary organs. They are often of great use in retention and incontinence of urine, of paralytic origin. They probably have a special affinity for the spinal centres. The poisonous species of *rhus*, especially the *toxicodendron*, have been recommended in palsy, and are applicable to this stage of the disease; but I have no experience with them. *Mustard* and *horseradish* are sometimes useful in old cases, attended with general debility, and especially with œdema of the limbs. *Sulphurous waters*, internally and as a bath, have also been recommended, and are occasionally useful. The hot-bath is sometimes beneficial when there is decided debility; but it should be avoided in cerebral cases. General debility should be treated with mild tonics, moderate exercise, pure air, the shower-bath when followed by reaction, and measures calculated to sustain an agreeable but not excessive mental excitement. Hence, travelling is very useful in some old paralytic cases. It is peculiarly important that the body should be protected against changes of temperature. Flannel, therefore, should always be worn next the skin. The diet should be nutritious, and of easy digestion.

Local applications to the paralyzed part are sometimes useful, by exciting the nervous extremities. Simple friction is one of the first measures of this kind that may be resorted to. It may be made with the hand, a flesh-brush, a coarse towel, &c. *Rubefacient lotions* are often used. Of these, oil of turpentine, and the ammoniacal preparations, are among the best. Tincture of capsicum or of cantharides may also be employed. *Blisters* are sometimes advantageous; but must be used with caution lest they occasion sloughing. They are more especially applicable to cases of small extent, and in which the circulation is not materially enfeebled; as to the wrist and forearm in lead palsy. *Electricity* or *galvanism* is one of the most efficacious of these local remedies, and should never be neglected in obstinate cases. Applied according to the method of M. Duchenne, so as to act directly on the paralyzed part, it is sometimes extremely useful. For the method recommended by that writer, and an account of the instruments employed, the reader is referred to the article on Electricity in my Treatise on Therapeutics and Pharmacology. M. Duchenne has succeeded in much relieving if not curing the obstinate affection, described under the name of progressive fatty muscular atrophy, by the use of this remedy. *Acupuncture* has been recommended, and a union of this with electricity is said to have been sometimes singularly beneficial. Needles are introduced into the flesh at some distance apart, and, by being connected with the opposite galvanic poles, enable a current of the fluid to be carried through the palsied muscle itself. *Firing* by means of a heated instrument of iron has been employed with advantage. (See vol. i. p. 573.) The *douche* of *hot water*, and, when there is sufficient energy for prompt reaction, of *cold water*, will sometimes be found useful. The hot-water douche is especially beneficial in cases connected with long-standing gout or rheumatism. Another method of exciting the part is by *its exercise*. The patient should be encouraged to make habitual efforts to use it, and means should be contrived especially calculated to bring the paralyzed muscles into play.

Local measures should also be addressed to the vicinity of the nervous centres. Rubefacients, blisters in constant succession, and electricity are the most effectual.

Of the particular forms of palsy little need be said. General palsy, hemiplegia, paraplegia, and local palsy are to be treated on the same principles, reference being always had to the seat of the disease. Ergot has recently been employed with supposed efficacy in paraplegia, after the cessation of all inflammatory excitement in the spinal column, supposing the affection to have originated in this condition. Iodide of potassium has also been much used of late, and is said to have proved advantageous in some instances. A case of progressive muscular atrophy is recorded, in which that remedy is thought to have effected a cure. (*Med. T. and Gaz.*, July, 1863, p. 36.) In the reflex cases, it is especially important to ascertain and remove the exterior source of irritation. In paralytic affections of the tongue and fauces, the local stimulants, when used, should be employed in the manner of masticatories or gargles. The former mode is probably the best. Ginger-root, horseradish, mezereon, pellitory, or, if something exceedingly acrid is wanted, the root of the Arum triphyllum, may be used. In palsy of the sense of smell, stimulating errhines may be employed, such as veratrum album or yellow sulphate of mercury, duly diluted. In *rheumatic* or *hysterical palsy*, narcotics are sometimes advantageous, especially opium in the form of Dover's powder; and chloroform may prove useful, applied locally, or given internally with camphor. In the *shaking palsy*, after the removal of any known cause, gentle tonics, the nervous stimulants or antispasmodics, and, when not contraindicated by cerebral disease, the narcotics may be used; care being taken to keep the bowels regularly open. M. Piorry has treated the *mercurial palsy* very efficiently by causing the patient to drink very copiously of cold water, even to the amount of three gallons daily, and conjoining the use of long-continued bathing and friction. Iodide of potassium is strongly recommended in the same affection, under the impression that it serves to eliminate the mercury through the kidneys. The *lead palsy* generally gets well under the measures recommended for colica pictonum. When unattended with that affection, it may be treated with nux vomica or strychnia internally, the warm or hot-bath, the sulphur-bath, and the various local measures above recommended, especially repeated blistering to the forearms. Alum, sulphuric acid, and a moderate continued mercurial impression may be tried, one after the other, in obstinate cases. Iodide of potassium will probably prove useful by eliminating the lead; and it is now considered by many as the most effectual remedy. In the falling of the hand consequent on palsy of the extensor muscles, the hand should be supported in an extended position by splints, or otherwise, so as to prevent the mechanical stretching of the relaxed muscles; blisters being at the same time successively applied along the back of the wrist and forearm. This affection is said to have been cured by frequent immersion of the hand and arm in a bath of solution of sulphuret of potassium. Inunction with ointment of iodine or iodide of potassium has also been recommended.

In all cases of palsy, the temperature of the part affected should be guarded. As it is at the same time insensible to the changes of heat and cold, and more liable to be injured by them than in health, because possessed of less vital power of resistance, it is especially necessary to have a watchful care over it. As the bowels are apt to become loaded with feculent matter, in consequence of the insensibility of the rectum, and the bladder to be distended with urine from a similar want of sensibility, as well as from paralysis of its muscular coat, the attendant must keep a careful watch over these functions, employing, in the former case, mild laxatives, enemata, or, when these fail, mechanical means for emptying the rectum, and in the latter case, if necessary, the catheter.

Article II.

HYSTERIA.

HYSTERIA (from *ὑστερα*, uterus) is a disease consisting in a morbid excitement of the nervous system, showing itself in occasional convulsive paroxysms, and diversified functional disorder. It is characterized by the extreme diversity and changeableness of its symptoms, which come rapidly, and as rapidly disappear, occur singly or in groups with every possible variety of association, and, though often presenting an alarming aspect, are almost never really dangerous; being a mere ebullition upon the surface of life, while its depths are undisturbed. One of the most striking circumstances connected with the disease, is the general integrity of the nutritive process, amidst the seeming almost universal insurrection and uproar of the functions. Through long periods of intense suffering, and great apparent disorder of system, the patient often continues plump and even rosy, as if in good health. The subjects of the disease are generally females between the ages of puberty and the cessation of the catamenia.

Symptoms, Course, &c.—The morbid phenomena of hysteria are very apt to cluster, forming paroxysms, which occur at irregular periods. In some, these paroxysms constitute the chief signs of the disease; the health being tolerably good, and sometimes almost perfect in the intervals. In others, there is scarcely ever complete exemption, even through a long course of years; and the paroxysms are merely exacerbations of a never-ceasing disorder. In most, the slightest causes are sufficient to occasion some disturbance, and, though the inter-paroxysmal symptoms are not constant, they are very frequent, and often the source of great discomfort. Perhaps the best view of the disease can be attained by first fixing attention upon the paroxysms, and then passing in review the most prominent of the phenomena connected with the derangement of the several functions.

The hysterical paroxysm is often preceded, for a longer or shorter time, by various distressing sensations and nervous irregularities, which become at length more than the nervous centres can tolerate; and relief is sought in violent muscular disturbance, and a more or less complete loss of consciousness. But frequently also these phenomena come on suddenly, without any premonition whatever, under the influence of occasional exciting causes, especially those of a mental character. The patient is sensible of distress at the epigastrium, or oppression about the chest, or perhaps has the feeling as of a ball ascending from some point in the abdomen, usually the left iliac region, to the throat; loses the ordinary expression of countenance, which is replaced by a vacant stare; becomes agitated; falls, if before standing; throws her limbs about convulsively; twists the body into all kinds of violent contortions; beats her chest or epigastrium; sometimes tears her hair, and attempts to bite herself or others; and, though a delicate female, evinces a muscular strength which often requires four or five persons to restrain her effectually. The jaws work with a sort of grinding motion, the chest heaves, the heart palpitates tumultuously, the carotids throb, the features become flushed and swollen, and the patient now and then utters inarticulate sounds or cries, which have been compared to the baying of a dog. Sometimes, instead of the convulsive movements, there is a tetanic rigidity of the muscles, and the body is thrown back into an arch, or the limbs are stiffly contracted; and not unfrequently there is a mixture of the two conditions. The spasms often relax for a time, and are again renewed; and this may occur repeatedly during the paroxysm. There is during all this time an apparent want of consciousness, which, in severe cases, is real and complete, but often is only partial; the patient having a confused knowledge of what is said and done about her, and being able to recall the incidents of the paroxysm imperfectly after it is passed. The features are seldom greatly distorted; and, though there is, to a considerable extent, an absence of expression, there is yet an indefinable appearance, as if the inner life were not sympathizing with the outer violence, and as if there was something unreal in the whole show. After a variable continuance, the convulsions subside, consciousness partially returns, and the patient, sometimes breaking out into a fit of laughter or sobbing, or of one after the other, sometimes falling into a quiet state resembling sleep, gradually returns to her ordinary condition, though with feelings of fatigue and soreness, occasionally with temporary cataleptic stiffness, or partial palsy of some part of the body, and not unfrequently with a copious flow of colourless urine. All these symptoms, however, at length disappear; and then the patient experiences great relief, often feeling better than for a long time previously; as if the morbid excitability had exhausted itself, and given place, for a time, to a healthy state of the nervous system.

The duration of the paroxysm varies from fifteen minutes to several hours, and sometimes it continues for two or three days, though with remissions of the convulsions, and intervals, if not of consciousness, yet of calm stupor. In many instances, there is a rapid succession of convulsions, the patient being quite conscious in the intervals; and in this condition, with longer or shorter respite, the affection may continue for many days or weeks.

But the paroxysm varies exceedingly in character and intensity. Sometimes it consists simply in feelings of abdominal or pectoral distress, with troubled breathing, sensations as of choking in the throat, bursts of weeping or of laughter, and slight twitchings of the muscles, not amounting to convulsions, and without loss of consciousness. Sometimes the prominent sensation is that, before alluded to, of the *globus hystericus*, as of a ball in the abdomen, rising to the epigastrium and the throat, and probably owing to a spasmodic constriction of the intestinal tube, and of the œsophagus. But this symptom is much less frequent than might be inferred from the descriptions in most of the books.

Another variety of the paroxysm is that of quiet coma. The patient lies perfectly motionless, with the eyes closed, apparently without consciousness, and incapable of being roused by the loudest sounds, shaking, pinching, &c., to which she seems to be quite insensible. The respiration is sometimes so feeble as hardly to be perceptible, the surface is cool, and bystanders are apt to think that the patient is dead; but the pulse, so far as I have observed, is always perceptible, and the countenance, though calm and motionless, wants the sunken aspect of death, and is rather as of one sleeping. In these cases I have generally found, since the custom of examining the spine has come into vogue, that there was great sensitiveness to pressure upon some one or more of the spinous processes, evinced by the starting and writhing of the patient, though without being thoroughly roused. This comatose state sometimes continues for one, two, or three days.

The occurrence of the paroxysms is usually quite irregular, at intervals varying from a day, or less than a day, to months, depending partly on the degree of accumulated excitability in the nervous system of the patient, partly on the variable incidents which may disturb her physical or mental equability. There is one circumstance, however, which tends to give a periodical character to the nervous symptoms. They are very apt to be worse about the menstrual period, and some women have a regular hysterical paroxysm at that time. Hence, probably, the origin of the notion that the moon exercises some influence over the affection. When the monthly changes of that planet coincide with the return of the menses, some confusion, in relation to the etiology of the paroxysms, may readily happen in the minds of those who are addicted to the mysterious. Like most other purely nervous affections, the hysterical paroxysms occasionally assume the types characteristic of intermittent fever, and are then regarded by some, though without sufficient reason, as nothing more than that disease in a concealed form.

It is highly important for the practitioner not only to be able to recognize the hysterical paroxysm, but also to be familiar with the irregular phenomena of the disease, which often so closely counterfeit other more dangerous affections, that there is great liability to error of diagnosis, and consequent serious mistakes in practice. The following is a list of the most striking of these phenomena, taken in the order of the several functions. To enumerate all the deranged actions and sensations incident to the complaint, and their various associations, would be an endless task.

In the digestive function, we not unfrequently witness difficulty of deglutition. The patient cannot, or thinks she cannot swallow, and the attempt is attended with strangling sensations. In its highest intensity, this symptom is only temporary; but I have known it to continue in some degree for months, very much limiting the diet of the patient, and producing considerable debility. The sensation of choking, of stricture in the throat, or of a foreign body lodged in the œsophagus, is very common, and is of the same nature, probably, as the well-known phenomenon of the globus hystericus. The stomach is much and variously disordered. Craving, deficient, or depraved appetite; desire for strange articles of food, or a disposition to swallow substances altogether unfit for food, even those of the most disgusting nature; various dyspeptic sensations, flatulence, spasmodic pains, and vomiting sometimes excessive and obstinate, are among the occasional gastric symptoms; and yet digestion goes on; and it is wonderful how, with so much seeming disorder of stomach, the general fulness and appearance of health should suffer so little. There has no doubt been much deception in cases of asserted entire abstinence from food for long periods of time; but such cases usually have some foundation in fact; and the minuteness of the quantity of nourishment, sufficient to support life for months in some nervous females, has often been an object of surprise to physicians. The bowels are usually disposed to flatulence and constipation. Great distension is sometimes produced by the collection of air in the intestines, so as even to imitate, and to have been mistaken for pregnancy. This is often accompanied with rumbling, irregular protrusion of the abdomen, the gathering of the abdominal muscles into knots, and various distressing sensations; and is one of the greatest sources of trouble to hysterical patients. Sometimes attacks of violent intestinal spasm come on, so characteristic of the affection as to have received the name of *hysterical colic*. The constipation will sometimes continue for weeks if not cared for. Occasionally there is diarrhœa, with unhealthy evacuations. Another abdominal affection is acute pain and excessive tenderness upon pressure, which, coexisting with distension, and a frequent pulse, have sometimes been mistaken for signs of acute peritonitis, and led to corresponding treatment. But the affection may be distinguished by the want of that profound impression which peritoneal inflammation makes upon the features, by the frequent coexistence of other hysterical symptoms, by the presence of a similar sensitiveness in other parts of the surface, and by a general appearance of superficial character about the symptoms, of which the practitioner is sensible, though he might find some difficulty in analyzing it.

The function of respiration also suffers. The larynx may be the seat of various irritation, in some instances modifying or suppressing the voice, in others giving rise to spasm of the glottis, which for a time completely obstructs the entrance of the air into the lungs, and yields only on the approach of asphyxia. In this way the disease occasionally imitates laryngitis and croup. A hard, dry, sonorous cough, sometimes occurring in convulsive paroxysms, like those of hooping-cough, is another symptom. Great oppression of the chest, with laboured breathing, is not uncommon; and dyspnœa, with a sense of constriction, bearing a close resemblance to the paroxysms of spasmodic asthma, is every now and then noticed. Deep sighs, yawning, and hiccough are frequent hysterical phenomena.

The circulation scarcely suffers less than the other functions mentioned. Palpitations of the greatest violence, attended even with the bellows murmur, are very frequent, alarming the patient and the practitioner with the fears of organic disease of the heart; from the phenomena of which, however, they may be distinguished by their exceeding capriciousness, and the frequently perfect calmness of the circulation. Troublesome aortic pulsations are also sometimes felt at the epigastrium; and the pulse is exceedingly irregular, being at one time very frequent, at another time perhaps slower than natural, and almost always easily disturbed by slight causes.

Secretion, which is so much under nervous influence, could not but be affected by derangements of that influence such as occur in hysteria. The liver and kidneys are especially liable to suffer, and almost all the functional disorders incident to the biliary and urinary organs may be looked for in this complaint. Both secretions may be deficient, excessive, or variously altered. The urine is sometimes so copious as to imitate diabetes, and in some rare cases has been almost or entirely suppressed. In the latter condition, the constitution appears occasionally to protect itself by an elimination of the urinary principles through some other outlet; and it is impossible to resist the evidence in favour of those cases, in which a liquid having the odour of urine is asserted to have been thrown out by the umbilicus, the external meatus, the stomach, &c.; though it must be confessed that great allowance should be made for the insane propensity to deception, evinced by some females under these circumstances. The excretion of urine is liable to still greater irregularity, as it is more under the influence of the deranged will. Sometimes a temporary paralysis of the bladder renders the excretion for the time impossible; but much more frequently the retention is in some degree voluntary, and it is of great importance not to encourage this morbid propensity by unnecessary instrumental aid. A general irritation of the urinary organs is occasionally evinced, which it may be difficult to distinguish from nephritis and inflammatory affections of the passages. A phenomenon connected with this branch of the subject, now and then met with in hysterical patients, is the secretion from the mucous membranes, especially that of the fauces and air-passages, of a red fluid resembling diluted blood, though not coagulable. This has sometimes been noticed in amenorrhœa, and has been supposed to be vicarious to the menses; but I have seen it in cases in which the menstrual function was apparently healthy.

One of the most singular facts in this singular disease is that already alluded to, of the apparent vigour of the nutritive function in the midst of the general disorder. Sometimes, however, this function suffers with the rest, and the patient becomes emaciated; but, in cases of this kind, there is always some reason to suspect the existence of organic disease.

The reproductive function is peculiarly liable to derangement. So common, indeed, is disorder of the uterus, that it has given its name to the complaint. Occasionally the uterus, upon examination, is found displaced, being either prolapsed or retroverted. Menstruation may be painful, excessive, scanty, or suppressed; and there may be a general irritable state of the organ, with or without disorder of the secretion. Yet the disease constitutes no necessary bar to conception and pregnancy. Cases, too, of hysteria are not uncommon, in which no derangement of the sexual organs can be discovered.

The nervous system exhibits above all others a proneness to derangement. That system is, indeed, the very seat and throne of the disease; and, in its various ramifications, are displayed almost all the fantastic vagaries of this curious affection. Of the general nervous phenomena, pain of one kind or another is among the most frequent. Neuralgia is very often a purely hysterical affection. Headache is very common, and sometimes almost insupportably violent. A frequent form of it is that denominated *clavus hystericus;* a fixed pain in one spot, generally over the eye. But it is often also more or less diffused, and is liable to all the diversities incident to this affection from other causes. (See *Headache.*) Pains in the chest, too, are very frequent, especially on the left side under the mamma. In this situation they are sometimes very severe and obstinate. The mamma itself is occasionally acutely painful, giving rise even to the suspicion of cancer, and causing great distress on this score. It is unnecessary to speak individually of the neuralgic pains in the abdomen, the spine, the urinary and sexual organs, and the extremities.

The joints sometimes become the seat of violent pains, much increased by pressure and motion; which have occasionally been mistaken for evidences of inflammation. One of the best diagnostic symptoms, in these cases, is the superficial character of the tenderness. The patient is apt to complain as much, when the skin is merely pinched, as when the surface of the joint is pressed upon. Morbid cutaneous sensitiveness is indeed a common symptom of the disease. Pressure on any part of the body will, in hysterical cases, often occasion much apparent uneasiness; and not unfrequently, when the physician supposes that he has detected inflammation of some internal organ, in consequence of the pain on pressure over it, he will find upon trial that the patient will make similar complaints, no matter what part of the surface may be made the subject of experiment. This tenderness is peculiarly apt to be evinced by the skin in the vicinity of the spine. One of the most common complaints by hysterical patients is of general and vague discomfort, of sensations in various parts of the body which they cannot describe, or feelings of soreness, uneasiness, and aching in the limbs, which induce a constant restlessness, and disposition to motion.

The special senses frequently suffer. Intolerance of light and sound, perverted vision, even loss of vision, noises of various kinds in the ears, and derangements of the senses of smell, taste, and touch are not uncommon.

The function of voluntary motion is notoriously perverted. The characteristic convulsions of hysteria have already been spoken of. The muscles sometimes contract rigidly, as in tetanus. Instances every now and then occur in which permanent contractions take place, with deformity of the limbs, and even distortion of the body. Catalepsy is also sometimes imitated; and hysteria has even put on the characters of hydrophobia. The opposite condition of palsy sometimes occurs; and *hysterical paralysis* is not a very rare affection. Like other affections connected with the hysterical state, this is distinguishable from most other varieties of palsy by its comparatively ready curability.

The sensorial functions are greatly disturbed. Attention has been already called to the headache, tinnitus aurium, and perverted vision of hysteria. Vertiginous sensations are very common. Sleep is often greatly disturbed. The occasional attacks of stupor have been noticed. These may be taken for cerebral meningitis by the inexperienced. They are, however, readily distinguishable by the expression of the face, which is not that of profound coma, and by the state of the skin and the pulse, which are often natural, not to speak of the spinal tenderness, which, when observed, is an almost infallible test. The patient is exceedingly liable to spells of causeless low spirits, with various marks of nervous disorder, which are popularly called *the vapours*. Occasionally the spirits are, equally without cause, excessively elated. The patient will at one time burst into tears or sobbing, at another time into giggling or laughter; and in either case without any assignable reason. The temper is apt to be impatient, capricious, and whimsical. Slight causes excite anger, and bring on convulsions or other nervous paroxysms. Occasionally the cerebral functions are so much deranged that the disease amounts to insanity. This shows itself in a great variety of modes. Sometimes the patient is obstinately silent, hides her head under the bedclothes, refuses to show her tongue, to take her medicine, &c. Sometimes, on the contrary, she is talkative, and tells of strange sights that she has seen, or incidents in which she has been concerned, both equally unreal; sings, dances, or makes other whimsical motions. One of the strange tendencies of *hysterical insanity* is to deceive others in relation to the state of the urinary and genital functions; and the patient will sometimes take great pains, and contrive the most skilful plans to convince her attendant that she has retention of urine, or passes calculi from her bladder, or throws up urine from her stomach, &c. This tendency in hysteria is sometimes, in part, founded upon a desire to attract commiseration and sympathy, or to become an object of attention or notoriety, sometimes upon a prurience in the sexual propensities; but quite as frequently it is probably real insanity. It is important to distinguish this form of mental alienation from insanity of the ordinary kind. The former is often a trivial affection, is generally harmless, and should not be allowed to condemn the patient to a residence among lunatics, which might convert it into a serious disease. It is distinguishable by its changeableness, its frequent disappearance and return, and the presence of various other symptoms characteristic of hysteria.

In every case of hysteria, the practitioner should examine the state of the spine. He will often find tenderness when the spinous processes are pressed; and this is not only an important diagnostic sign, but also affords valuable indications of treatment.

It is necessary that the student should understand that he is not to look for all of the above phenomena in every case of hysteria. Some patients present one, others another set of symptoms, and the same patient exhibits very different symptoms at different times. There is every grade of the disease, from the mild attacks called the vapours, to the most violent convulsive or comatose paroxysms; from a few slight nervous irregularities, occurring now and then, to an almost uninterrupted continuance for months or years of the most distressing complications of functional disorder. In some instances, the disease gradually yields to time and remedies; in others, it disappears abruptly, either not to return, or only as a new attack after a long interval. It is apt to decline with advancing life, and to go off entirely about or after the cessation of the catamenia. Pregnancy is said occasionally to suspend it. Should it persist, with severity, for several years, there is some danger that it may end in more serious diseases, such as epilepsy, mania, or disease of the heart. Sometimes it degenerates into hypochondriasis, with failure of memory, and mental weakness. It is almost never directly fatal. Instances have occurred in which fatal apoplexy supervened upon the hysterical paroxysm; but they are very rare, and probably purely accidental; such as might result from any cause producing a determination of blood to the head.

Anatomical Characters.—Nothing has been discovered upon post-mortem examination calculated to throw light upon hysteria; except in so far as the absence of observable lesions, having any reference to this affection, in patients who have died of other complaints while labouring under it, may be considered as a proof of its purely functional nature.

Causes.—An unusual degree of excitability or mobility of the nervous system constitutes a predisposition to hysteria. This is sometimes received by inheritance. Parents affected with severe nervous diseases are apt to have hysterical children. The female constitution is especially favourable to the attacks of the disease; and it is very apt to occur in women between the ages of twelve and thirty. But a predisposition may also be created, when it does not pre-exist. Whatever impairs the energy, and increases the excitability of the nervous system may have this effect. Sedentary habits, confinement to an impure air, living in hot rooms and sleeping in hot beds, too much indulgence in sleep, vicious practices in the young, and the premature forcing by light and imaginative reading in early life of the emotional part of the character, have a strong tendency to generate the hysterical constitution. The difference in the education and subsequent habits of the two sexes, has a powerful effect in confirming their respective natural tendencies in relation to hysteria. The boy is strengthened against it by free exercise in the open air, the man by the invigorating influence of his bodily and mental struggles for a livelihood or pre-eminence. In the female, the predisposition which she derives from nature is too often fostered by confinement in girlhood, and by a pernicious system which affords her, in opening womanhood, at once the leisure and the means for the indulgence of the feelings and imagination, at the expense of the hardier mental qualities. The debility of convalescence from acute and exhausting diseases, as well as that which follows excessive depletion, encourages the approaches of hysteria. The anemic state is highly favourable to it, by the irritable condition which it maintains in the nervous centres. The notion has been entertained that continence predisposes to the disease; but this appears, from the statements of those most experienced, to be a mistake. The complaint is most prevalent among persons of irregular lives and vicious habits.

Among the exciting causes may be ranked everything capable of producing a strong impression upon the nervous system. Startling sights and sounds, astounding intelligence, surprise, terror, anger or vexation, jealousy, grief, and disappointment, especially of the affections, are apt to induce the first symptoms of the disease, and, when the morbid state of the system has become established, to provoke the paroxysmal attacks. The imitative principle is a powerful cause; and instances are frequent, in which the sight of one female in hysterical convulsions has thrown others, previously exempt from the disease, into similar paroxysms. Extremes of heat and cold, and certain electrical conditions of the air, are also ranked among the causes.

But more frequent exciting causes are probably various morbid states of the system, which serve as sources of irritation to the nervous functions. Thus, the origin of hysterical attacks has been traced to the retrocession of cutaneous eruptions, and the checking of habitual discharges. I have no doubt that gouty and rheumatic disease often exhibits itself in this kind of disturbance of the nervous system. I have before expressed my belief that spinal irritation, which is so frequent an attendant on hysteria, and is probably in many instances the immediate cause of the morbid phenomena, very often originates in these two disorders. Diseases of the alimentary canal, and of the uterus and its appendages, are among the most frequent exciting causes of hysterical phenomena. There is undoubtedly a strong connection of some kind between hysteria and the condition of the sexual organs in the female. Most women experience, at one time or another of their lives, symptoms at least analogous to the hysterical, at the catamenial periods.

Nature.—There is only one opinion in relation to the functional character of this disease. Authors, however, differ greatly as to its primary seat. Some place it essentially in the uterus, and, in support of their opinion, appeal to the fact that hysteria is a feminine disease; occurs during the period of life when the uterine functions are in full vigour; is very frequently attended with disorder of the uterus; and is peculiarly apt to exhibit its characteristic symptoms at the menstrual periods. But this exclusive uterine theory cannot be supported. Almost all the best writers admit that the disease now and then occurs in males; and in women, though it is certainly most frequent between puberty and the change of life, it is yet occasionally noticed before the former, and subsequent to the latter of these periods. Besides, cases are not uncommon in which the uterus and its functions are, so far as can be ascertained, perfectly sound.

Another theory places the disease exclusively in the brain. But the evidences of spinal participation are at least as strong as those which point to the brain; and the frequent disorders of almost all the organic functions would seem to prove, that the ganglionic centres are not without their influence.

The very frequent complication of spinal tenderness has induced Dr. Tate and others to make the spinal marrow the special seat of the disorder; but cases occur in which this symptom is quite wanting, and many of the phenomena can scarcely be ascribed to any other than a cerebral origin.

It appears to me that all these exclusive hypotheses are too partial. The whole nervous system, in all its centres, and in all its ramifications, exhibits signs of derangement; and as each part of it is occasionally, to all appearance, independently deranged, it would seem to follow that no one part was the essential or exclusive seat of the disease. The nature of the complaint seems to be a morbidly excessive excitability of the whole nervous system, which renders it liable to be thrown into disorder by causes insufficient materially to disturb its action in health. The influence of the uterine system is probably that which its very existence exerts over the nervous. The office of reproduction in the female is a most complicated and important function, which, in order that its several operations may be sustained in due harmony, requires the constant oversight and interference of the nervous system. This must, therefore, be in a condition of excitability, capable of answering quickly to the calls that may be made upon it, and of consequence peculiarly liable to be disturbed by morbid causes. Hence the more frequent occurrence of the disease in women, and at that age when the uterine functions are in full vigour. Uterine disorder may give rise to hysterical symptoms, just as intestinal disorder is known to do. Neither is essential; and probably both are quite as frequently the results of the hysterical condition, as they are themselves exciting causes of its peculiar phenomena.

Diagnosis.—The affection with which the hysterical paroxysms are most liable to be confounded is epilepsy. It is important to be able to distinguish them; as the one is often curable, the other when fully established but too frequently bids defiance to medicine. Hysteria compared with epilepsy is in general a trivial disease. The most prominent diagnostic symptoms are, on the part of the epileptic paroxysm, the comparative unpreparedness of the patient, the sudden cry at the commencement of the fit, the frightful distortion of the features, the permanent dilatation or contraction of the pupil, the livid turgescence of the face, the foaming at the mouth, the small quantity of air admitted into the lungs in respiration, the comparative brevity of the convulsive portion of the fit, and the profound coma which attends the convulsions, and continues for some time after they have ceased. In hysteria, the paroxysm generally comes on less suddenly, or if sudden has an obvious cause; there is no loud cry at the outset; the features are seldom distorted, and foam seldom appears at the lips; the pupils often change upon exposure to the light; the face, though flushed, is usually bright red, and not livid; the respiration is less embarrassed; there is throughout the paroxysms an appearance as of a concealed will, obscurely mingling with the causes of the phenomena, and sometimes an obvious degree of consciousness; there is an absence of deep coma after the subsidence of the convulsions; and, finally, the hysterical laughter and sobbing are, when they occur, quite characteristic. In the intervals between the paroxysms, the epileptic patient of long standing almost always exhibits the marks of the disease in a peculiar physiognomy; while in hysteria, the face, under similar circumstances, has usually all the appearance of health both in its physical character and its expression.

But now and then hysteria and epilepsy coexist; and the practitioner will, therefore, be prepared to meet with a mixture of their respective diagnostic symptoms in the paroxysms. Laughter on one side of the face is mentioned as one of the most prominent indications of this union of the two affections.

In the preceding remarks on the symptoms of hysteria, occasion has been taken to point out some of the diseases which this affection is apt to counterfeit, and the means by which it may be distinguished. Inflammation of the brain, apoplexy, palsy, laryngitis, asthma, organic disease of the heart, gastritis, peritonitis, nephritis, and inflammation of the joints and spine are among the complaints alluded to. Tetanus and hydrophobia, and indeed numerous other affections, might be added to the list. In all these cases, it is in general only necessary to bear in mind the distinguishing features of hysteria, to be able to recognize it in its disguise. The superficial character of the affection, which often shows itself to an experienced eye in the midst of the greatest apparent violence; its fickle, shifting tendency; the want of correspondence between the violence of the functional disorder, and the usual evidences of organic disease; the frequent intervals of apparent health; the tendency to causeless laughter and weeping; the want of an expression of deep disease upon the countenance; the frequently normal state of the skin and pulse, and the fitful character of the latter when excited; and, lastly, the very frequent presence of tenderness of one or more of the vertebræ, are signs which, if the practitioner is upon his guard, can scarcely fail to prevent mistake, at least in all ordinary cases.

Treatment.—The treatment may be divided into that required for the paroxysm, and for the relief of the prominent symptoms, and into that calculated to cure the disease by correcting the cause of irritation, and changing the irritable condition of the nervous system.

1. During a convulsive paroxysm, the patient should be placed in bed, the dress should be loosened so as to prevent stricture anywhere, and so much restraint used as to obviate personal injury. It is scarcely possible to coerce every limb or muscle; nor is it desirable to do so; for the convulsions are to be looked on, rather as a safe outlet for the excessive irritation of the nervous centres than as in themselves hurtful. To rouse the patient, cold water may be sprinkled upon the face, and spirit of ammonia or other strongly odorous and somewhat irritant substance applied to the nostrils; but care must be taken not to use such substances in so concentrated a state as to excite inflammation of the nasal membrane or respiratory passages. The vapour from burnt feathers is an old and popular remedy. If the paroxysm persist, sinapisms may be applied to the insides of the legs, and ice or cold water to the head. If the patient can swallow, as sometimes happens in the intervals of the more violent spasms, one of the nervous stimulants may be administered, such as mixture of assafetida, oil of valerian, compound spirit of ether, or aromatic spirit of ammonia; but in general it is better to abstain from medicines by the mouth; as there is often difficulty if not impossibility of deglutition, and unpleasant laryngeal irritation may be superadded to the paroxysm. Injections, however, are often useful. Even the ordinary purgative enema, by evacuating the bowels, and thus removing a source of irritation, may afford relief; but the best material for exhibition in this way is assafetida or oil of turpentine, the former of which may be injected in the quantity of one or two drachms, the latter of one or two tablespoonfuls, thoroughly mixed with half a pint of warm water. The injection of ice-cold water, and of vinegar and water, has been strongly recommended.

Should the convulsion continue, notwithstanding these measures, the spine should be examined, and if tenderness on pressure of the spinous processes be found, blood should be taken by cups from the spot. This measure will often afford instantaneous relief. When the pulse is full and strong, the face flushed, and our previous acquaintance with the case justifies the belief that the system is plethoric, blood may be drawn from the arm; but this remedy should be used cautiously; as, though it may prove immediately useful, it may do ultimate harm by inducing or increasing an anemic state of the system, which is highly favourable to hysteria.

In very obstinate cases, consisting of frequently repeated convulsions, with partial returns of consciousness, I have found nothing more effectual than the nauseating influence of tartar emetic, given in doses of half a grain every half hour, or more largely if necessary, until its effects are felt.

Inhalations of chloroform will generally control the convulsions by inducing a quiet soporose condition; but this remedy should be employed only in extreme cases, and always cautiously, in consequence of the danger to life. Ethereal inhalation has also been employed successfully.

It will sometimes be advisable to speak in a decided tone, in the presence of the patient, of the necessity of shaving the head and applying a blister, should she not be soon relieved. Strong mental impressions have a powerful influence over the disease; and sufficient consciousness often remains, during the apparent coma, to appreciate an observation of this kind. It does not follow, because such a mental impression may prove useful, that the patient has been counterfeiting illness. It acts by replacing one impression by another even more powerful for a time. Perhaps the sedative influence of fear may allay the excitement of the nervous centres; perhaps a strong impression upon the emotional centres may act revulsively within the cerebro-spinal cavity, by calling off irritation from those which govern the convulsive movements. The patient may herself often do much in controlling the tendency to the hysterical paroxysms, by a determined exertion of her own will.

Milder nervous disturbances may often be quieted by the antispasmodics before alluded to, given either at the time of their occurrence, or steadily at certain intervals, in order to exercise a continued control over the nervous system. The pill, mixture, or tincture of assafetida; the infusion, oil, or tincture of valerian; Hoffmann's anodyne or sweet spirit of nitre; aromatic or fetid spirit of ammonia; or camphor-water, may be given in moderate doses three or four times a day, or occasionally as circumstances may seem to require. It is well to be provided with a long list of substances of this kind; for in many cases the calls upon the practitioner for additional means of relief are incessant; and not only is the attention of the patient occupied, but the impression upon her nervous system beneficially varied by this diversity of remedies. Oil of amber, compound galbanum pills, dracontium, and cimicifuga may, therefore, be added to the above list.

The severe pain of hysteria often calls irresistibly for anodynes; and it becomes necessary occasionally, both in answer to this call, and in order to procure sleep, to have recourse to the preparations of opium, or some one of its narcotic substitutes. Extract of hemp, hyoscyamus, belladonna, stramonium, conium, and the internal use of chloroform may be tried; and in fact all the measures before pointed out as applicable to the treatment of neuralgia; but care must be taken not to habituate the system to narcotic influences, if such a result can be avoided. Aconite may be employed when vascular fulness or irritation contraindicates the stimulant narcotics.

Rigid muscular contractions may often be removed by firm pressure upon the affected muscle, or by the pouring of a stream of cold water from a height of two or three feet upon the part. Thus, trismus may be relieved by compressing the masseter and temporal muscles; and obstinate flexion of the extremities by the cold douche.

Local-determinations to the head, chest, heart, &c. may be treated with occasional leeching, and blistering. These measures often afford great relief, and are urgently called for by the patient after having experienced their good effects. But the danger of too frequent a resort to local depletion must be guarded against; lest present ease be given at the cost of still greater future evil. The same end may often be effected by revulsion towards the extremities, by means of hot pediluvia or maniluvia, consisting of hot water alone, or of this rendered more stimulating by means of common salt, mustard, Cayenne pepper, &c. General revulsion to the surface is also extremely beneficial in numerous instances. This is most advantageously effected by means of general frictions, either simple, or with rubefacient substances. The cold bath, or shower-bath, if followed by reaction, will sometimes operate like a charm.

Disorder in the various functions, consequent upon the disease, must be attended to. But the measures requisite for this purpose will be found detailed elsewhere, under the heads of functional disease of the several organs. The derangements especially requiring attention are *spasm of the œsophagus, obstinate vomiting, gastralgia and gastric spasm, flatulence, colic, laryngeal irritation, severe cough, hiccough, dyspnœa, palpitations, syncope, functional disorder of the liver, retention or incontinence of urine, functional disorder of the kidneys, spinal irritation, headache* and *delirium*, to all of which the reader is referred, under their respective headings.

2. We now come to the treatment which is to be directed towards the cure of the complaint. Two indications are here offered, one to remove or counteract the existing causes, and the other to correct the extreme irritability of the nervous system. In order to fulfil the first of these indications, it is necessary to search diligently for any disorder in the system which may serve as a source of irritation, and, if any such can be found, to address our remedies to that disorder. I have before stated my belief that gout and rheumatism not unfrequently lie at the foundation of hysteria. If any grounds for such a suspicion should exist, the remedies for these affections when they assume the nervous character should be employed. (See *Nervous Gout*, i. 600.) Should any reason for referring the complaint to repelled eruptions exist, blisters, rubefacients, or pustulating applications should be freely employed, to invite irritation again to the surface. Should the healing of an old ulcer have been followed by the appearance of the hysterical symptoms, its place should be supplied by a seton or issue. The immediate cause of the nervous derangements will often be found in spinal irritation, which should be corrected by cups or leeches, blistering, or pustulation by croton oil or tartar emetic, of which the last is probably the most effectual. (See *Spinal Irritation.*) Another frequent exciting cause is disease of the alimentary canal. Constipation should be corrected by purgatives, at first somewhat active, and afterwards such as may be calculated to keep the bowels regular, without debilitating, as aloes, rhubarb, magnesia, sulphur, &c. The hepatic secretion should be corrected if deranged, and any existing symptoms of dyspepsia should be treated as directed under that disease. But the uterus demands a peculiar care, and its derangements, whether of function, position, or organization, should be corrected as far as possible. For the means of accomplishing this object, I must be content with referring to works devoted especially to the peculiar diseases of women, which do not fall within the scheme of the present treatise. There is, however, one uterine affection, of so frequent an occurrence, and so variously mingled with other diseases which have engaged our attention, either as cause, effect, or modifying coincidence, that I cannot pass it by without a more particular notice, especially as it has been referred to repeatedly in the preceding pages. Allusion is had to that condition of retained, deficient, or suppressed menstruation, which is known under the name of *amenorrhœa.* It is not my intention to enter into an account of the pathology of that affection, or even to consider it therapeutically at much length; but simply to indicate briefly what seems to me the appropriate treatment in order to answer the references made on former occasions.

Treatment of Amenorrhœa.—As all other deficient or suppressed discharges, this may be connected with excessive or deficient vascular action in the organ; and the treatment must be accommodated to these two conditions. When the discharge ceases from vascular irritation of the uterus, if there is at the same time general plethora, with a full and strong pulse, pain in the back or head, flushing of the face, &c., it will be proper to take blood from the arm, to administer a saline cathartic, to put the patient upon a low diet, and administer the warm hip-bath, or a general warm bath. With a gentle form of the same condition, the bleeding may be omitted, and the remainder of the treatment carried into effect. Should there be considerable uneasiness in the uterine region, with little or no general excitement, it may be proper to apply cups to the sacrum or leeches to the vulva, or inner and upper part of the thigh, and to repeat the application once or oftener, should the symptoms persist. If the pain and irritation be severe, it may be advisable, after the warm bath, to administer a full dose of the Dover's powder at bedtime, to be repeated if necessary to procure ease. Under this plan, the menses will usually return if the suppression be recent. Not unfrequently, when the affection is consequent upon taking cold, and is quite recent, it will yield to a hot pediluvium, and the administration of warm herb teas at bedtime, with or without a dose of the powder of ipecacuanha and opium. Sometimes, however, it happens that, though the general and local excitement may have been subdued, the suppression continues, consequent probably upon the depression following excitement, or upon a habit of inertness in the uterine vessels. Under these circumstances, it becomes necessary to resort to some one of the emmenagogue measures enumerated below.

The opposite state of uterine depression may be entirely local, or may depend upon an anemic, or otherwise debilitated condition of the system. In the latter case, it is necessary primarily to address remedies to the general affection; and it is especially important to correct the condition of the blood, when that is in fault. It is probable that the great majority of cases of amenorrhœa are of this kind. Certainly it has been so, in relation to the females who have come under my notice in the Pennsylvania Hospital. In such cases, attention having been paid to the hepatic secretion, which should always first be corrected if deranged, the strength should be recruited by mild tonics, moderate exercise on foot, on horseback, or in a somewhat rough vehicle, pure air, the shower-bath, gradually made cooler as the system is found to react under it, and a nutritious, easily digestible diet. In an anemic condition, the chalybeates should be preferred to other tonics. The bowels should at the same time be kept regular by laxatives, and especially by aloes. It happens that these remedies, while they tend to improve the general health, have a direct favourable influence upon the uterine function, which is thus restored along with the strength of the patient.

Supposing, however, the uterine affection to be quite local, or to persist after the correction of the state of the system, whether of excitement or depression, we are then to have recourse to emmenagogues. Of these, so far as my own experience permits me to decide, the preparations of iron and aloes are the most efficient. These may be indicated merely in reference to their tonic and laxative effects; but independently of these, they have, I believe, a direct influence upon the uterine function, and may be employed, with hope of benefit, in all cases in which over-excitement of the organ does not contraindicate them. I have seen much of this affection among the female patients who resort to the Pennsylvania Hospital, and have generally found it to yield to a combination of these remedies. One or two grains of aloes, and from five to ten of the pill of carbonate of iron (*U. S. Ph.*), may be given in the pilular form three times a day; or the same medicines may be employed in the liquid form, by combining the tincture of aloes, or the tincture of aloes and myrrh, with the tincture of chloride of iron. Other modes of administration may be resorted to if preferred; the great object being the administration of iron and aloes. The dose must be regulated by the effects, care being taken, on the one hand, not to irritate the bowels, or too much to excite the system, and, on the other, to obtain one or two passages daily, and to bring about a decided influence of the chalybeate on the blood. Myrrh is often added to the aloes and iron. The treatment should be persisted in, if necessary, for two or three months. It need not interfere with any active pursuits of the patient; on the contrary, such pursuits might be in themselves useful. Advantage will sometimes accrue, when the regular period of menstruation is known, from anticipating it by a full purgative dose of aloes.

If this plan fail, or if a more rapid effect is desired, we may employ one of the more stimulating emmenagogues. Among the most efficient of these is the ammoniated tincture of guaiac, in the dose of a fluidrachm three or four times a day. This sometimes acts most happily. A still more stimulating medicine, which has a strong tendency to the uterus, as well as to the other pelvic viscera, is tincture of cantharides. This may occasionally be employed with great effect. It may be pushed till it produces some slight symptoms of strangury, and afterward should be kept within that point. The oil of turpentine has also been recommended. Savine, too, is decidedly emmenagogue. Seneka has been thought to be useful, and, being a general stimulant to the secretions, may sometimes bring on the menstrual discharge; but it cannot be relied on. The preparations of iodine act on the same principle, and occasionally with very good effects. Borate of soda has been recommended. (*N. Y. Journ. of Med.*, N. S., i. 387.) Black hellebore has, from high antiquity, enjoyed great reputation as an emmenagogue, and is still much relied on by many. It may be given when aloes is too irritant to the rectum, or cannot be employed on account of the existence of piles; and when, at the same time, there is an indication for cathartic medicine.

Local measures addressed to the uterus are sometimes advantageous. A hot hip-bath is strongly stimulant to that organ. A blister to the sacrum may be useful. Electricity should be tried if other means fail. The injection of solution of ammonia into the vagina has been recommended. Ten drops of the liquor ammoniæ may be added to a fluidounce of water, and injected three times daily, the quantity of the stimulant being increased or diminished according to its effects; the object being so to regulate it as to produce a feeling of warmth or slight uneasiness, without considerable irritation. In very chronic cases, advantage may accrue from wearing constantly on the small of the back a compound galbanum plaster, or a warming plaster.

Correction of the irritability of the nervous system.—To return to the more immediate subject of hysteria, we are next to consider the means calculated to answer the last indication; that, namely, of correcting the irritability of the nervous system. This must be done by giving it increased vigour. Hence, the tonic plan of treatment is indicated, when not forbidden by the existence of plethora or a disposition towards it. But those tonics should be selected which have a special tendency to the nervous system. Such is quinia, which may sometimes be used advantageously; especially when the complaint assumes the intermittent form, or exhibits any approach towards it. But, on the whole, the metallic tonics are most advantageous. Sulphate of copper or ammoniated copper, sulphate or valerianate of zinc, and nitrate, oxide, or chloride of silver, are those from which most good may be expected. They may often be advantageously associated in prescription with laxative medicines, and with the narcotics when these are at the same time indicated. Other means calculated to meet the same ends are the daily use of the cold or shower-bath, exercise in the pure air, and a wholesome nutritious diet. Tobacco, coffee, strong tea, and alcoholic drinks should as a general rule be forbidden. Hot and crowded rooms, the dissipations of society, and all causes of excessive excitement, including the reading of pernicious novels, should be shunned. The patient should rise early, exercise in the morning air, and retire early to bed; but the exhaustion of excessive sleeping should be avoided. Mattresses should be preferred to feather beds, unless in the coldest weather. The surface should be protected against changes of temperature, and especially against the cold of winter, by flannel next the skin. All vicious habits, that have a tendency to produce or foster the diseased state of the nervous system, should be corrected.

But the most effectual plan of cure is completely to change the circumstances under which the patient may be placed, and to bring a new set of influences to bear upon the nervous system. The remarks made upon this point in the treatment of neuralgia are equally applicable to the disease under consideration. A change of residence from town to country, a sea voyage, a long journey, a residence abroad, are among the most efficient measures.

The work has now been brought to a close. A survey has been taken of all the diseases belonging exclusively to the Practice of Medicine, as distinguished from the other practical branches of our art. Certain affections, which have usually been regarded as common property by medical writers on the one hand, and surgical or obstetrical writers on the other, have been omitted in this treatise; because it has seemed to the author that the space they would occupy might be more profitably devoted to ampler details in relation to diseases strictly medical. Among the affections alluded to are those of the eyes, the ears, and the male generative organs, and the diseases peculiar to women. In reference to the mode in which the author has accomplished his task, he has but one remark to make. Occasional repetitions of the same pathological views, and the same principles and modes of practice, will have been noticed by the reader in his progress through the work. But a certain amount of repetition could not be avoided without great inconvenience. The close analogy between many diseases required the same train of thought for their elucidation, and an enumeration of the same remedies in the account of their treatment. A reference under each successive disease, to previous observations and conclusions whenever applicable, would have implied a memory such as few readers can boast of, or the necessity of a constant recurrence to the past, more irksome, and more likely to consume time, than a restatement of the principles and facts required. Whether the proper medium in this respect has been preserved, must be left, with all other questions in relation to the execution of the work, to the impartial judgment of the reader.

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